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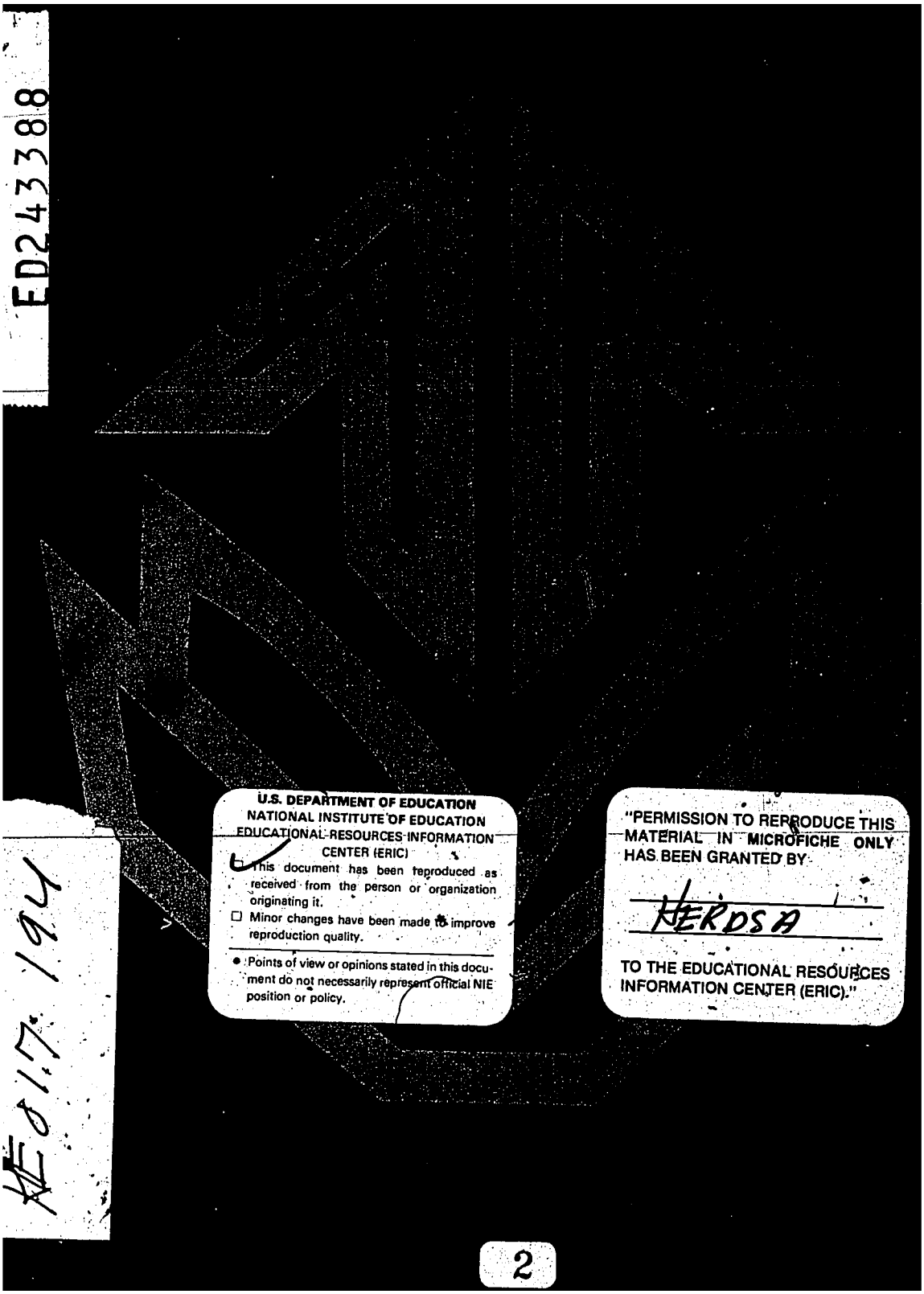
ABSTRACT

The status of women in college and employment, the attitudes of mature-age alumni, individualized instruction, unsuccessful innovations, and grading are addressed in five articles in this issue of an Australian journal. "Women in Advanced Education, Advancement for Whom?" (Jan Craney, Carol O'Donnell) cites evidence to indicate that the greater power of male groups has influenced the differing course structures and enrollment patterns faced by male and female students, as well as the lower employment status of women. Next, the attitudes of 266 mature age graduates are reported in "Mature Age Study: Was It Worth the Effort?" (Rod McDonald, Susan Knights, Burnice Everall, Anne Quilty, Dianne Sansom). The third article, "Approaches to Individualising Instruction--A Review" (Margot Pearson), examines the development of the individualized instructional mode and reports evidence on outcomes. "Specifications of a Grading System" (B. W. Imrie) discusses concepts of assessment and provides examples of grading systems used in New Zealand universities in 1983. The fifth article, "Anatomy of an Unsuccessful Innovation" (Charles E. Noble), examines an interdisciplinary studies innovation in the field of energy studies. Review articles on the following topics are also included: evaluating academic development, academic tenure, and critical thinking and education. (SW)



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Women in Advanced Education Advancement For Whom?

Jan Craney and Carol O'Donnell

ABSTRACT

This article traces the rise and decline of the advanced education sector. It points out that the formation of the sector results in large part from the political efforts of male dominated professional organisations and educational institutions to delineate and enhance their spheres of influence. This partly explains the differing course structures faced by male and female students, and the enrolment patterns of the sexes. There is thus the strong suggestion that the lower pay and inferior labour market position of women is related to their lack of opportunity to organise to pursue their industrial interests both in the work place and in the educational institutions that lead to it.

We argue also that increasing participation rates of women in advanced education do not necessarily lead to enhanced labour market chances. How women will fare in the workforce depends on whether employers base their selection of employees primarily on the applicants' length of education, type of qualifications, or sex. This point is elaborated in our discussion of changing CAE enrolment patterns for women, and has implications for those involved in forming policies aimed at ameliorating the rate of female youth unemployment.

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ADVANCED EDUCATION ENROLMENT PATTERNS — AN OVERVIEW

Advanced education as a distinct sector of tertiary education was created in 1965 by the Federal government as a response to the Martin Report of 1964. Over the first decade of its development, its growth was rapid. In 1968 the advanced education sector housed 3.5% of the 17-22 age group. In 1977 it housed 9.7% and was numerically three times larger. Between 1968 and 1977 there was an average annual increase in enrolments of 13.6%. (1) However, in 1977 recession conditions finally caught up with advanced education. Since then, first year intake has been held constant at the 1977 level and overall enrolments began to decline after 1978. At the end of the period of growth, between 1975 and 1978, the number of students in CAEs had increased by 27%. Increases in 1978 were of part-time students only, with a 1% decline in the number of full-time students. Since 1977 there has also been a decline in the number of students in the 17-19 age group, reflecting the falling proportions of school leavers moving directly to higher education. There has been an increase in the number of older students (30+), especially older female students. There has been an increase of female students overall, in spite of the declining participation of young female students. In 1975, 46.9% of newly enrolling students were women, and in 1980 women were 50.3% of new enrollees. (2) Women have constituted about half of new enrollees since 1978.

Women's participation in advanced education is concentrated in three fields: teacher education, liberal studies and paramedical studies. In 1975 these fields accounted for 81.8% of new female enrolments for first qualifications and 45% of male enrolments. In 1980 these fields still accounted for 67.3% of first female enrolments, but only 29.3% of male enrolments. While enrolment of men and women in CAEs is almost equal, more women than men actually graduate. The higher dropout rate of male students appears to be connected to their greater likelihood of being part-time and/or older than female students. The proportion of female school students moving directly from school to CAE training fell from about 32% in 1974 to about 25% in 1978, while the male proportion remained stable at about 20%.

The above trends are not indicative of a particularly bright future for women. As we shall argue later, the nature of their participation in advanced education must be linked to the paucity of their workforce options in a segmented labour market where 84.4% of women in the workforce are in overwhelmingly female occupations employing only 10% of the male workforce. (3) Women are concentrated in 18 of the 61 occupations listed by the government statistician. (4) More than a quarter of the female workforce is in sales, cooking, waitressing, housekeeping, caretaking and cleaning. A third of the female workforce is in the clerical area. Just over 10% of the female workforce is in nursing and teaching, occupations at the top of the female workforce hierarchy but which hold a doubtful professional status. (5) Even in occupations that are predominantly female, positions of power and status tend to be held by men. This is particularly apparent in teaching, and appears to be an increasing trend. (6) Within a particular occupational field, occupations with higher status and which have the option of private or self-employment tend to be predominantly male, although the field as a whole might be predominantly female. This trend can be seen in the paramedical field, where pharmacy and physiotherapy have a higher proportion of self employed males than females. Occupations in the field which involve lower paid hospital-type employment are predominantly female.

The advanced education sector enabled innumerable industry-related tertiary training and work areas to be developed largely for men, with a status equivalent or identical to those entered through university training. The narrowness of the range of female occupations, the great need for teachers during the 60s and early 70s, and increased demands for higher education, meant that proportionally more and more women enrolled in teaching or teaching-related courses at universities, CAEs and former teachers' colleges. Women also crowded into paramedical therapies and the social welfare area. Such training usually leads to government or government supported employment, so that its utility as a job ticket depends partly on government commitment to the area and on relatively high rates of government expenditure.

DEFINING THE ADVANCED EDUCATION SECTOR

The Martin Report, which led to the development of advanced education as a distinct sector of tertiary education, was born of an era of continuous economic boom unprecedented in Australian history that produced an accelerated need for tertiary trained workers. The boom was linked to growth in technically advanced, capital intensive industries, and massive infusions of cheap migrant labour into unskilled menial work. It saw widescale upward social mobility, especially for Australian born males, into technologically based white collar occupations. The service sector also expanded, an area of traditionally female employment. Concomitant expansion of social welfare and other government services meant increasing female employment in the fields of health, education and social welfare areas generally.

Sir Leslie Harold Martin, an academic and a director of IBM, chaired both the Australian Universities Commission and the Martin Committee. Three of the fourteen members of the Martin Committee were full-time corporate executives or directors, several others had close corporate connections, and the academic representatives on the committee were biased towards the sciences. The only humanities or social science member was Professor Peter Karmel, Professor of Economics, proponent of the then popular view that education was a dominant factor in economic growth. In the words of the Prime Minister, Menzies, the

committee was "widely representative containing not only expert opinion but business expertise and financial experience". It contained no women. (7)

The Martin Committee recommended a tripartite structure for tertiary education. It proposed that in addition to universities, an Institute of Colleges and a Board of Teacher Education be established in each State, to receive Commonwealth financial aid on the same basis as universities. It stressed the comparability of these institutions with universities, asserting that the lack of comparable institutions caused undue pressure to be brought upon many (unsuitable) young people to attend (and fail) at university. It saw degree courses as a possibility for these new institutions in the future, and more basic diploma courses as the appropriate starting point. It made no comment about the proper balance of degree and diploma courses. Balanced development between the three sectors was to be ensured by the newly proposed Tertiary Education Commission.

Defining the status of education and training institutions, and fields of study and qualifications within the tertiary sector, is an ongoing problem. Before the Martin Report there was a binary system of tertiary education composed of technical colleges and universities, with considerable variation from State to State. Teachers' colleges and technological institutes also provided vocational training for particular workforce needs and, compared with universities, were poor relations in the system. In the early 60s technological institutes grew in power and importance, many with a tradition of conferring degrees that were accepted as equivalent to university degrees. Universities in some States had long been offering diplomas, and sometimes degrees, in applied, vocational fields of training, such as pharmacy and physiotherapy, which technological or other institutes handled in other States, notably in Victoria. University failure rates were a constant and growing problem. It was clear that a massive expansion of tertiary education was necessary, that it needed to be boosted in more vocational directions, and that divisions between courses and sectors had to be clarified.

Federal government response to the Report was positive and fast. By June 1966 the newly formed Commonwealth Advisory Committee on Advanced Education had released its first report (the first Wark Report), which attempted to translate the Martin recommendations into a working plan and outlined strategies, financial and otherwise, for the achievement of the newly envisaged advanced education sector.

The Martin Committee was extremely vague in its description of the functions of, and differences between, the various tertiary streams, an aspect of the Report that received immediate criticism. (8) In the views of some commentators these problems are incapable of resolution. (9) Prescriptions expounded in the Wark Report include that advanced education should be diverse, should be primarily vocational, should be concerned with applied courses and research rather than that centred around disciplines, should emphasise teaching over research, and should develop a close association with industry and other relevant organisations. (10)

It has been claimed that an underlying assumption of the advanced education sector was that it would pick up the "weaker brethren" and relieve universities of the burden of catering for the "lower level" of matriculant. (11) Studies of the social class background and academic attainment on entry of university and advanced education students suggest that the oft-quoted maxim of "different but equal" was not quite the case. The advanced education sector has consistently had a higher proportion of less academically able

students, from lower socio-economic backgrounds. (12) The lower academic ability of advanced education students was a visible problem when tertiary fees were charged. Far fewer advanced education students than university students held Commonwealth scholarships, yet because of their poorer backgrounds their need for scholarships was greater. (13)

Women were scarcely represented in the advanced education sector in the early years. Their absence was unnoticed by educational planners. The two Wark reports clearly envisage the typical CAE student and staff member as male. They emphasise coordination with industry, for both students and staff. They express concern that staff salaries must be "at a level which will attract men of quality and give them a sense of career opportunity". The slight concern expressed in the Martin Report about women in tertiary education (discussed later in this paper) was quite forgotten in later considerations of women in advanced education.

INSTITUTIONS AND FIELDS OF STUDY

In the establishment of the advanced education sector, certain existing institutions were approved as "colleges of advanced education" and financial aid extended to them on the same basis as to universities, provided they were teaching "to the standard of attainment at diploma but not at degree level". Twenty-six institutions were recognised initially. These were the institutes of technology and major technical colleges in each State and some small specialised colleges for art, agriculture, nursing, pharmacy, speech therapy and occupational therapy. In the race to line up for recognition and funding the Victorian institutes and technical colleges were first off the mark, having already been grouped by the Victorian Government in the Victoria Institute of Colleges Act, 1965. In the first Wark Report of 1966 the Victorian Government is listed as submitting proposals for advanced education status for 10 institutions, seven of which belonged to the newly formed Institute of Colleges. In the second Wark Report of 1969 Victoria is listed with 19 recognised CAEs as against nine in N.S.W., with a much larger population. The Victorian initiatives can be understood in terms of the power of its technological institutes and technical college, some of which conferred degrees through association with the universities. The Victorian action ultimately helped make the technological institutes in all States the tall poppies of the advanced education sector. These were, of course, male dominated colleges, running primarily male dominated technical and business oriented courses.

In the early stages of the growth of the sector the only real representation by females was in art, liberal studies and paramedical therapies, and in isolated nursing and teaching courses. The paramedical field was a large field of study in the sector from the first, with between two-thirds and three-quarters female enrolment. With the exception of teacher education, it is today the largest area of study in the CAEs. Nursing has not generally been incorporated into the advanced education sector. The Wark Committee gave approval to the incorporation of post diploma nursing courses within the paramedical field of the advanced education sector, but was wary of making a commitment to diploma level training. This was supposedly because of the size of the field (90,000 registered nurses in Australia) and the necessity for trainees to have access to appropriate hospitals for extensive ward duty. Even the modest proposals for some incorporation of nursing within the advanced education sector, as recommended by most reports on nursing, including

the 1980 Sax Report, have been shelved for the time being. The inclusion of more nursing courses in CAEs is still on the agenda, in spite of long-standing opposition from the A.M.A.

At first it had been planned that diploma and not degree courses were to be taught at colleges of advanced education. Institutions such as the Victorian College of Pharmacy saw that they would lose some of their status, as they had long conferred degrees equivalent to university degrees. Pressure arising from this fear led to the Federal Government appointment of the Wiltshire Committee in July 1968, which reported in June 1969. The Committee presented a new system for classifying courses in the advanced education sector which included both diploma and degree courses. It observed that a number of advanced education courses in applied sciences, engineering, architecture, building, and business studies were the same length and level as corresponding university courses. A system for the accreditation of courses was included in the Report. Accreditation was, and still is, an involved and complex procedure with proposals channelled through committees at State and then at Federal level. The technological and commercial courses mentioned above, many of which had gained degree status before the economic recession took hold, had a faster and smoother voyage to degree status than the later arrivals to the sector.

The power and influence of male dominated professional and para-professional associations and professional registration boards over the length and status of advanced education courses was an important factor influencing developments in advanced education. It operated to enhance the status of courses predominantly studied by men. The most notable case was the Institution of Engineers, which accredits practising engineers and has influenced the education of engineers. The Martin Report supported the Institution of Engineers' rule that a four year training course was necessary for engineers, accelerating the growth of bachelor degree courses in engineering in the advanced education sector. The Institutes of Physics, Chemistry and Architects have had a lesser, though significant, role in influencing course development in CAEs. Professional Associations in Cartography, Radiography, Surveying and Town Planning have also pressed for changes to advanced education courses. The tendency has been to upgrade to the highest level in each field, advantaging professional fields that were quick off the mark, powerful, and had a good case for upgrading through links with universities.

THE INCORPORATION OF TEACHER EDUCATION

Although originally the Martin Report had envisaged a tripartite structure to tertiary education with a Board of Teacher Education separate from an Institute of Colleges, teacher education became incorporated into the advanced education sector in 1973. In line with the findings of the British Robbins Report of 1963, it was agreed that low and variable standards in teacher training resulted from State education departments funding the training and employing its products. The Martin Report had proposed some multi-purpose rural colleges that would include teacher education. The States supported these plans, because it meant that funding would cease to be a State responsibility. The second Wark Report refers to proposals from three States to include teacher training in CAEs. (14) It was clear that the inclusion of teacher training under the advanced education umbrella would mean that a CAE would be made viable in a small centre that could not otherwise provide for tertiary education. (15) There were obvious benefits for all,

and teacher education was officially and totally hauled under the advanced education umbrella in 1973, following the recommendations of the Senate Standing Committee on Education, Science and the Arts, which reported in June 1972. However, since 1969 teacher education had become an increasing part of the advanced education sector with the acceptance of teacher education in multi-disciplinary regional rural colleges, and at Hobart.

Women's present equal representation in the advanced education sector came about through the incorporation of teachers' colleges. This move overnight doubled the number of CAE's (from 39 to 78), added greatly to the number of students, radically changed the ratio of full time to part time students, and equalised the sex ratios. Teacher education thus became the largest field of study in the advanced education sector. The dramatic effect of the inclusion of teacher education on the number and sex of students in CAEs can be seen from the following table. The effect of the rapid decline in teacher training can also be seen.

As well as entering the advanced education race well after the starting gun, teacher education entered without such watertight claims to upgrade its courses to degree status as the technological courses. Different conditions applied to teacher education in each State and teacher education, coupled with a degree, was already carried out in the universities. In general, university trained teachers entered the workforce with a more advanced standing and a different career structure from college trained students. A university degree was, in general, seen as essential to secondary teaching, except in the times of critical teacher shortage when "junior secondary courses" were spawned to get teachers into high schools fast. The teachers' colleges which became CAEs were largely devoted to training primary teachers. Primary teaching courses had been only recently lengthened from two to three years. The

TABLE 1: Number of newly enrolling students, per cent of female students and per cent of Teacher Education students, 1971-81

	1971	1972	1974	1975	1976	1977	1978	1979	1980	1981
Total	17,408	20,078	44,659	58,165	55,845	61,264	62,243	62,149	65,757	68,389
% Female	25	27	45.4	46.6	47.2	48.5	49.6	50.9	50.3	49.4
% Teacher education students	2.7	9.1	41.8	44.0	42.6	40.8	40.8	30.6	26.8	25.3

Source: Australian Bureau of Statistics, Colleges of Advanced Education, selected years 1971-81.

Commonwealth Advisory Committee on Advanced Education (CACAE) gave consideration to longer courses for a small number of specialised pre-service courses but proposals from some States that all three year pre-service courses be lengthened to four years were not accepted. The bulk of teacher education courses continued as three year courses, and every proposal for degree status was rigorously scrutinised. (16) The National Enquiry into Teacher Education (the Auchmuty Report) of 1980, recommended that a four year preparatory course be set as a target to be achieved in the 80s, against widespread opinion that such action is not justified, largely for economic reasons. Degree courses in primary teaching were being introduced in N.S.W. only in 1981. These courses are more narrowly vocational than similar degree courses in universities and do not supplant diploma courses.

WOMEN IN HIGHER EDUCATION: THE MARTIN AND FOLLOWING REPORTS

Women gain a cursory mention in the 500 page Martin Report. In a three-quarter page review of the situation of women in higher education it commented on women's low representation in university enrolments overall, and their extremely low representation in fields other than humanities. It claimed that there was a "wastage of talent" among women. It noted with pleasure the 4% rise in the proportion of female students at universities between 1953 and 1963, and made a brief comment that the quality of science teaching in girls' schools might be so low as to preclude some girls from a scientific or science related career. It also drew attention to the barriers preventing the full participation of married professional women in the workforce (without being specific about any of them) and noted that the situation was "not in the best interests of the nation". It made no attempt to explain why there was a poor representation of women at universities, nor why science teaching was poor at some girls' schools, nor why there had been an increased participation of women in universities in the last decade. In its projections for future university enrolments it estimated that by 1975 there would still be twice as many men as women attending universities.

Thus, while commenting on the "wastage of talent" among women, it accepted it as inevitable and likely to continue. While commenting that in some respects Australian women were disadvantaged in comparison to their overseas counterparts, and while locating two likely areas of disadvantage, it offered no proposals for remedying them. Its general proposals for increased participation in tertiary education were oriented toward able boys and girls who drop out of school early. The special disadvantaged situation of girls was not dealt with in its recommendations. In a report grounded in the belief that education is a key factor in economic growth, it is surprising that the clearly demonstrated wastage of female talent was condoned. The Martin Report clearly assumed that women would not be contributing to economic expansion through gaining the technological education the Report promoted.

The two Wark Reports of the Commission on Advanced Education (CAE, 1966) and the Commonwealth Advisory Committee on Advanced Education (CACAE, 1969), neglected the very modest start made by the Martin Report and scarcely mentioned women at all. The second Wark Report made brief mention of the retraining of older women graduates for the resumption of professional careers. The question of pilot courses for diploma nursing level was also raised. But the place of women in the advanced education sector was not subjected to an informed analysis by policy makers in that area.

The Schools Commission's Girls, School and Society, published in 1975, a comprehensive analysis of the educational inequality of women, re-examined in depth issues that the Martin Report had mentioned in passing ten years earlier. It drew particular attention to the sexist ethos of schools and the ways the curriculum preempted career choice for many girls. It was based on concern about the social and economic implications for women of the "wastage" of female talent and of sexually divided workforce and training systems. By that time the advanced education sector had reached its peak, with established patterns of male and female participation. Some of the dangers of these patterns were pointed to in Girls, Schools and Society, but these warnings were ignored.

THE WILLIAMS REPORT AND THE EFFECTS OF THE RECESSION

The Williams Committee into Education and Training deliberated in 1977-78, a time of economic recession. Expansion of many Australian industries was no longer expected. The task at hand was not to expand education and training but to cut enrolments and expenses. At the same time widespread concern and higher expectations for women in education and the workforce could not be disregarded. The Williams Report, while commenting on differential enrolment rates of men and women in universities and TAFE, had very little to say about women in CAEs. In addition, it failed to examine the implications for women of focussing on TAFE at the expense of other (more expensive) post-school sectors. Its treatment of women was fragmented, cursory and inadequate.

The Report's proposals for the strengthening of one large CAE in each State is evidence of the powerful position of the technological institutes which entered the advanced education sector early. These institutes bound themselves together separately from other CAEs under the Directors of Central Institutes of Technology (DOCIT). In its submission to the Williams Committee, the DOCIT group claimed that these colleges should be recognised as "senior" institutions on the basis of criteria they themselves advanced. It claimed that certain colleges should have a special direct relationship with Federal authorities, similar to that of universities, and that they should be separate from other CAEs. Men make up the bulk of the students in DOCIT colleges. (17) The Williams Report's discussion of rationalisation of the advanced education sector has led to proposals that 30 CAEs be amalgamated, most of them institutions in which teacher training predominates and female enrolments are high.

The era of expansion of teacher education is now over. The incorporation of teacher education into advanced education added only one member to the CACAE to speak on behalf of the area. Little resistance to government policy has been exerted from this direction. A non-growth directive for teacher education was included in the May 1976 guidelines to the CAEs for the 1977-79 Report. Enrolment in teacher education, especially in primary courses, is now declining and is well below the 1977 level.

TABLE 2: Number of students commencing degree and diploma teacher education and paramedical studies courses at colleges of advanced education in Australia, 1974 to 1981

	1974	1975	1976	1977	1978	1979	1980	1981
Teacher education	16,578	21,174	18,699	19,019	15,312*	15,240	14,147	14,624
Para-medical studies	1,207	1,545	2,294	2,743	2,768	2,888	2,784	2,286

* See Note to Table 3

Source: Australian Bureau of Statistics, Colleges of Advanced Education.

Teacher training is drawing its female entrants increasingly from middle class backgrounds. It is no longer a means of working class upward mobility into a middle class occupation, especially for women. The Correy Report of 1980 (18) revealed that in New South Wales female teacher trainees were five times more likely than male teacher trainees to come from professional/managerial backgrounds.

Teaching has been particularly affected by the elimination of Teacher Education Scholarships at the State level. While the effects of the abolition of Teacher Education Scholarships are not being officially monitored, research done within CAEs indicates that low income and rural female students have been particularly affected. (19) The latter are students who have little prospect of obtaining other tertiary or job training, and their job prospects in the present era are bleak.

It is clear that female students and female areas of study in CAEs have always had secondary status. They have been largely overlooked in government reports on the sector and they have not had professional organisations strong enough to make their interests heard and taken into account. Male dominated institutions and professional organisations, on the other hand, have been politically active and comparatively successful in pursuing their interests.

TRENDS IN TRAINING, EMPLOYMENT AND UNEMPLOYMENT OF GRADUATES

Over the last decade in CAEs female areas of study have become more strongly feminised; at the other end of the spectrum, the male bastion of Engineering and Technology has experienced little incursion of female students. Other areas of study, for example, Applied Sciences and Commerce and Business Studies, have experienced the gradual incursion of women students, partly as a result of the bleak prospects available to teacher trainees.

But the picture of enrolments in CAEs is complicated by the distinction between degree and diploma levels of study. Whilst the proportion of women

is increasing in diploma courses, the proportion of men is increasing in the more prestigious degree courses, as is shown in Table 3. About three quarters of the students in CAEs are enrolled in either bachelor degree or diploma courses, which together contain almost all the students entering tertiary training for the first time. The proportion of bachelor degree students has increased from 27% of new enrollees in 1974 to 49% in 1980. The proportion of diploma level students declined from 52% in 1974 to 26% in 1980. Women have always dominated diploma level courses, and this trend has increased. In 1974 women were 57% of diploma level enrollees. In 1980 they were 70%. Women have also moved into degree level courses and in 1980 were 43% of new enrollees, predominantly in female fields of study. Some penetration of women into male dominated fields has occurred, but mainly at the diploma level. Male dominated fields have more easily upgraded to bachelor degree level, so that in 1980 only 8% of students in the five major male fields were studying at the diploma level. The proportion of students studying at the diploma level in the five major female dominated fields was 48%. For teacher education the proportion studying at diploma level was 65%.

The increasing participation rates of women in CAEs and the incursions they have made into some male dominated fields of study at the diploma level in particular tell us little about women's job prospects. Berg (20) assumed that employers would normally choose the job candidate with the most years of education. He was arguing against those economists, such as Becker in the human capital school (21), who claimed that employers would only employ the person who had the appropriate type of qualification for the job. From the latter perspective "the overqualified" would not, supposedly, be employed in menial jobs. But the question of whether the most highly qualified or the most appropriately qualified gets the job is complicated by the potential employee's sex. In contradiction of Berg, for example, studies of the Hunter Valley show that the male ex-student is more likely to find a job than the female ex-student who has undergone many more years of education. (22) On the other hand, CAE graduates are, as a group, harder hit by unemployment than university graduates. This, particularly in view of the argument that CAEs are "more practically oriented", undermines the human capital perspective claim that employers will not select the "over qualified". A study of the differences in unemployment between male and female CAE graduates casts further light on the debate about the relationship between education and workforce participation. Such studies have caused some policy makers to argue that women's high unemployment rate generally can be explained by their participation in the wrong areas of study, rather than by lack of educational qualifications. This argument also needs qualification. Table 4 shows the destinations of male and female university and CAE graduates.

TABLE 3: Number of students and percentage of female students commencing degree and diploma courses in CAEs, by field of study, selected years, 1974-81.

	1974		1976		1978		1980		1981	
	No.	%F	No.	%F	No.	%F	No.	%F	No.	%F
BACHELOR DEGREE COURSE										
Agriculture	143	25	63	11	125	21	131	21	204	24
Applied Sciences	2,064	21	3,150	21	3,256	28	3,783	35	3,770	36
Art and Design	57	60	164	47	1,526	52	1,718	57	1,962	58
Building, Surveying, Architecture	560	5	669	10	1,024	8	1,052	23	1,239	23
Commerce and Business Studies	4,594	16	6,674	18	8,850	24	9,283	29	9,209	31
Engineering and Technology	2,205	1	2,566	2	2,289	2	2,854	2	3,211	3
Liberal Studies	1,706	55	2,482	60	4,955	61	5,080	65	5,957	64
Music	35	77	81	64	259	63	318	53	398	56
Paramedical	764	67	1,490	72	1,758	75	1,701	73	1,842	74
Teacher Education	874	66	2,355	60	3,254	63	5,045	68	5,496	65
	13,002	26	19,694	31	27,396	39	30,965	43	33,288	44
DIPLOMA COURSES										
Agriculture	323	19	264	18	236	21	165	30	84	21
Applied Sciences	411	19	181	24	520	56	441	55	451	43
Art and Design	1,899	56	2,077	55	1,648	55	1,387	62	993	60
Building, Surveying, Architecture	489	19	597	20	319	29	302	25	190	21
Commerce and Business Studies	2,773	18	1,789	26	1,292	54	527	59	441	69
Engineering and Technology	959	2	549	2	248	0	96	0	78	1
Liberal Studies	1,650	53	1,220	62	1,324	60	1,042	60	808	62
Music	279	63	260	62	225	60	192	65	99	66
Paramedical	443	83	804	68	1,010	76	1,083	78	1,329	76
Teacher Education	15,704	71	16,344	72	12,058	79	9,102	74	9,128	67
	24,930	58	24,085	63	18,880	70	14,337	69	13,601	65

Note: A revised classification in 1978 resulted in the classification in other fields of study of courses that in previous years were allocated to teacher education. For example, Bachelor of Education - Mathematics, and Graduate Diploma in Teacher Librarianship are now included in Applied Sciences and Liberal Studies respectively. This re-classification accounts for apparent increases in female enrolment in certain fields from 1978 on.

Source: Australian Bureau of Statistics Colleges of Advanced Education 1974-81.

TABLE 4: University and CAE graduates unemployed on April 1 of the year following graduation, by sex, 1974-81

GRADUATE OF	SEEKING EMPLOYMENT				UNAVAILABLE FOR EMPLOYMENT			
	University graduates		CAE graduates		University graduates		CAE graduates	
	% M	% F	% M	% F	% M	% F	% M	% F
1974	5.4	4.6	11.0	4.4	1.6	5.8	2.0	3.7
1975	7.6	5.3	7.5	6.7	2.0	5.9	1.8	6.6
1976	7.4	7.3	6.2	6.8	3.1	6.9	1.7	5.5
1977	8.3	9.8	7.8	10.5	2.8	6.6	2.1	7.0
1978	7.9	10.6	9.8	15.0	2.4	7.3	2.3	8.2
1979	6.8	9.6	12.1	21.8	2.7	7.0	1.7	7.5
1980	6.9	11.2	9.9	22.2	2.6	8.1	2.1	9.7
1981	7.5	11.4	10.5	21.2	4.0	9.7	3.5	11.9

Source: Destinations of University and College Graduates, Graduate Careers Council of Australia, 1975-81.

1981 data supplied privately by the Graduate Careers Council, as the official publications no longer include these details.

Over the period there was a steady increase in unemployment for all graduates, except male CAE graduates, whose high initial unemployment rate can be linked to the sudden decline within engineering and building industries. Overall, women had higher unemployment rates than men, and female CAE graduates had the highest unemployment rates of all graduates, with about 30% of them not making a successful transition from education to the workforce over the last three years. To avoid unemployment, women seem increasingly to have placed themselves in the "unavailable for employment" category. The pattern of unemployment seems to be linked more closely to sex than to the type of higher education institution attended.

The fields of study in which female CAE graduates had the highest unemployment levels in 1978 were humanities, social work, education, earth sciences, applied sciences, education and fine arts. In these fields unemployment levels were higher for the women than for the men, sometimes over 10% higher, suggesting discrimination in favour of men at the point of entry to jobs. Similar though less severe trends have been found among female university graduates. (12)

The pattern of unemployment is also related to the fields of work that males and females have available to them, with male CAE graduates being more likely to obtain employment in the private sector, as the following table shows.

TABLE 5: Destination of University and CAE Graduates, by Sex, 1974-81

GRADUATE OF	UNIVERSITY GRADUATES						CAE GRADUATES					
	Govt service (other than teaching)		Private industry commerce non-govt		/ Teaching		Govt service (other than teaching)		Private industry commerce non-govt		/ Teaching	
	% M	% F	% M	% F	% M	% F	% M	% F	% M	% F	% M	% F
1974	23	13	20	7	13	17	30	28	35	14	11	35
1975	19	12	20	9	12	17	29	22	40	16	12	36
1976	20	14	23	9	16	37	27	19	40	14	16	37
1977	20	16	24	11	9	11	23	13	33	7	23	52
1978	20	15	25	23	9	13	20	11	30	8	28	50
1979	20	17	27	13	8	12	21	14	33	11	22	37
1980	21	18	29	14	8	11	22	14	35	11	22	34
1981	21	17	29	15	7	11	21	12	35	11	22	36

Source: Destinations of University and College Graduates, Graduate Careers Council of Australia, 1975-81.

NOTE: All universities are included in the study each year. The number of CAEs included each year is as follows: 1974,24; 1975,23; 1976,27; 1977,59; 1978,63; 1979,64. The GCCA claimed that the samples of CAEs in the early years were "fairly representative of the overall graduate population" but there does appear to be an under-representation of colleges with large numbers of teacher education students.

The most marked and worrying trends for female CAE graduates is their dependence on employment in teaching and the paramedical field. In 1974, employment in these fields accounted for 60% of female CAE graduate employment, and in 1979 it accounted for nearly 71%. Of interest, too, is the type of work done by female college graduates who apparently do not obtain employment in their field of training. Among such students there appears to be a steady drift (of about 690 in 1980) towards clerical and secretarial work. Such a drift must act to some extent to push lesser qualified women out of the labour market as more and better qualified women compete for a dwindling supply of jobs in this area profoundly affected by technological change and government cutbacks.

This examination of female college graduate destinations was carried out before the effects of the latest severe cutbacks in N.S.W. State Government expenditure and freezes on new appointments had begun to make their mark on published statistics. The real picture now is likely to be grimmer for women than this paper was able to demonstrate. On present evidence, women CAE graduates have much bleaker employment prospects than their male counterparts. Equipped for areas of work suffering from funding cutbacks, many of them can look forward only to part-time work or jobs below their level of training. (24) Those who have managed to enter male dominated courses face competition from male graduates in related areas and probable discrimination based on sex at the level of entry to the work place.

CONCLUSION

In this study of advanced education we have shown that the relationship between education and work is an intensely political matter, and the greater power of male groups in pressing their interests has been one of the forces explaining the current situation of women in the institutions of higher education and in the labour market.

The statistics reveal that the enrolments of female school leavers in advanced education have been disproportionally reduced with the entrenchment of the economic recession and with the abolition of the teacher education scholarship. They reveal disturbingly high and rising unemployment rates among new female advanced education graduates. They suggest too that employers tend to prefer graduates with more prestigious training, from universities rather than CAEs, and that they tend to prefer male rather than female graduates in both male and female dominated work areas. These findings have important policy implications for the post school education and employment of women, suggesting that attempts to change girls' occupational preferences should not be the only thrust of policies to combat female youth unemployment. Equally or more important are policies aimed at increasing overall government expenditure, creating jobs and upgrading social welfare. Government supervision and control of employers' hiring practices in order to reduce discrimination is also necessary.

At present the scope of government economic and educational deliberations does not augur well for women. The Economic Summit was dominated by the interests of the ailing but powerful manufacturing industry which employs 18% of the Australian workforce and which holds very limited prospects for women. No interest was shown in the productive capacity of the service and government sectors where many people (and the majority of women) are employed. The current debates about low school and post school education participation rates

have focussed on TAFE as the post school institution to open its gates and fit its courses to the rising tide of young unemployed and underemployed. Conveniently swept aside is the plight of all those young people who would once have been expected to proceed from school to university or CAE training, and who now face lower level training in TAFE. Of all three post school sectors, TAFE is the most sexually segmented with women grossly under-represented in almost all its important vocational areas with the exception of almost total female domains such as secretarial studies and hairdressing. The decline of the manufacturing sector has meant a decline in apprenticeship opportunities. Under these circumstances getting women into apprenticeships should be one thrust of policy, but it should not be the only one.

Whilst certain qualifications have become essential prerequisites for specific types of work, employers in different areas of the labour market differ in their selection criteria. Some may prefer the university graduate, with sex or field of study of the candidate being of lesser importance, suggesting that women are well-advised to aim at university rather than CAE or TAFE courses. Others may select primarily according to the candidate's field of study, and it is this group at which policies encouraging girls into currently male dominated courses appear to be aimed. Other employers freely exercise a preference for the male candidate. Because a degree may prove a valuable qualification in the labour market, the teacher education graduate may find a job in the welfare sector or in administration, and is perhaps better off with a teaching qualification than with a trade or secretarial certificate from TAFE.

Some policy makers are veering toward a narrow manpower planning approach in order to deal with enforced belt tightening in post school education. It is instructive to remember that manpower planning has not worked particularly well in the past. During the post-war economic boom many male teacher trainees used a teaching qualification as a stepping stone to a more lucrative job in private industry (25), and there were teacher shortages. To deny young people a university or CAE place today to study the course of their choice may cut them off from the chance of employment in areas where employers choose the candidate with the highest level of qualification. Necessary attempts to aid women to enter male dominated areas of training in all post school sectors should not prevent us from trying to defend and extend more traditional options, especially as these may be just as useful to them in the long run.

It should also be stressed that many "female" occupations provide essential services to the whole community, and that women's equal participation with men in any work area is totally dependent on these services being maintained, strengthened and extended. The organisation of these work areas into articulate and powerful lobbies, demanding better recognition, expansion and adequate pay, is the current challenge facing women who work in them and women who benefit from their existence.

The post school education area needs to be subjected to more searching analysis. Old concerns for equality of opportunity in education should be resurrected and translated from the policy level into practical courses of action which include goals and targets for the participation of various groups. Tertiary education should be expanded and access to all areas of it should receive priority consideration. Tertiary quotas should be relaxed or removed and student allowances should be lifted so that students are not forced to live below the poverty line.

Employers should be forced to implement fairer and more open selection procedures. The enactment of Federal Anti-Discrimination legislation with provisions for Equal Employment Opportunity in all areas of employment, commencing with those receiving any form of government subsidy or tax benefit would constitute an important start.

NOTES

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Mature Age Study: Was It Worth The Effort?

Rod McDonald, Susan Knights, Burnice Everall, Anne Quilty, Dianne Sansom

ABSTRACT

There have been many studies documenting the upsurge in the number of mature age students in universities and colleges, and demonstrating their academic success. It has also been recorded that in returning to study, adults make sacrifices in finances, time, personal relationships and possibly interruption to a career. This paper reports a study which was designed to discover whether, in the view of mature age graduates, the benefits of a degree compensated for the sacrifices. The study involved 266 such graduates. Of those whose decision to enrol was motivated by personal reasons, 90% felt that they had achieved their objectives. Of those who entered university for career-related reasons, 70% said that their degree had helped them in their work. Even though some who had resigned jobs in order to study found themselves unemployed for a period upon graduation, many still felt that they had benefited personally. But the degree of satisfaction is even higher than these figures would suggest. For a number of graduates, their motivation changed from being essentially job related to involving personal growth. By the end of their studies, the satisfaction of having successfully completed a university course came to be valued more than the career advancement that might follow.

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INTRODUCTION

The influx of large numbers of mature age students is a well documented phenomenon of Australian higher education in the 1970s (Hore and West, 1980; McDonald and Knights, 1979; West and Hore, 1978). Encouraged by the relaxation of rigid school-oriented entry requirements, increasing availability of places, and - in the case of many women - by the growing acceptability of seeking personal fulfilment beyond the confines of home and family, the percentage of mature students has risen steadily. In one of the newest institutions, Murdoch University in Perth, mature entrants formed a majority of the student population for several years. A study carried out at Murdoch in 1977 showed that undergraduates over 25 years of age were generally coping very well with university life and felt that they were at no disadvantage because of their age (McDonald and Knights, 1982). However, it was clear that for nearly all the students their decision to undertake a university degree involved some personal sacrifice in terms of income, family life, leisure time or job security. These sacrifices were seen to be necessary and worthwhile in the cause of personal fulfilment and expected career advancement. In order to assess how far the results of gaining a degree matched up to these students' initial hopes and expectations, a survey of mature age graduates was undertaken in 1980. Since a majority of those interviewed in the first study had indicated career motivations as their major reason for entering university, special attention was paid to patterns of employment before, during and after graduation.

CONDUCT OF STUDY

The study began with a series of informal interviews with ten mature age Murdoch graduates, after which a questionnaire was designed and posted out to the 266 mature age students who had graduated from the university in the three years it had been granting degrees. Since the emphasis was on employment experience after graduation, those who had stayed on for further studies at Murdoch were excluded. However, graduates who had taken up full-time study at other institutions were included as they could not be identified in advance. With the assistance of one follow-up letter, replies were received from 194 students - a response rate of 73%. In order to put their employment experience into context, graduates were asked for details of their employment before, during and after their time at Murdoch. They were also asked about their motives for becoming mature age students and about how much they felt their Murdoch qualification had contributed to their gaining employment or assisted them in their careers. Finally they were invited to comment on the extent to which they felt that their original objectives (both personal and career-orientated) had been achieved.

The age range of the respondents is shown in Figure 1. At the time of the survey, 16% had been away from university for three years, 37% for two years and 46% for one year. Mature age graduates from Murdoch University's first three years had a variety of academic backgrounds. In contrast to the popular impression of mature age entry providing a "second chance" for adults, only 15% had entered without formal matriculation, and 68% had previous experience of tertiary education. A majority of the graduates had enrolled at Murdoch less than 5 years after their previous studies, 16% had been away for between 6 and 10 years and two had not attempted any formal study for over 40 years.

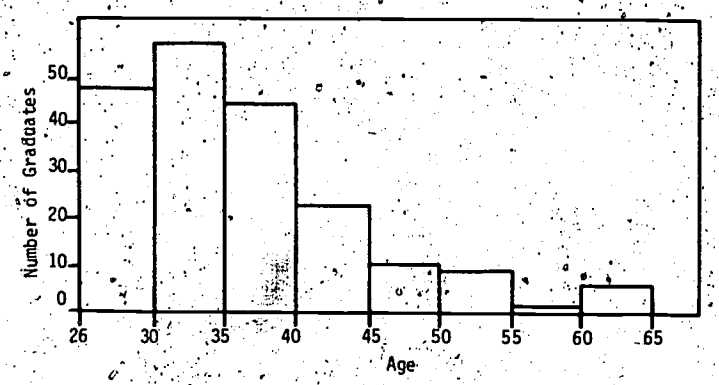

Figure 1: Age distribution

RESULTS

Motivation

The graduates' answers to questions about their reasons for studying for a degree and the programme they chose to follow indicated the importance of employment-related considerations. Seventy-two percent gave their reasons as primarily career related, "to upgrade or improve existing qualifications" or "to qualify for a new job or career". Seventeen percent enrolled for reasons "of a personal nature not related to career", and 10% said their motivation was a balance of the two. These results are similar to those obtained in an earlier study of mature age students at various stages of their undergraduate careers (Knights and McDonald, 1978). More men than women (80% versus 60%) gave career related reasons, a very similar figure to that obtained in a recent study by the Open University (Swift 1982). Twenty-one percent of women (as opposed to 13% of men) enrolled for reasons "of a personal nature not related to career". Although the decision to take a degree course was strongly career-oriented, the programme chosen was often influenced by personal interest rather than career considerations. Only 30% of respondents indicated that both their return to study and their programme of study were dictated by career considerations, the same percentage chose to enrol for career purposes but chose their programme on the grounds of personal interest, 16% gave "personal reasons" as the motivation both for enrolment and choice of programme and 11% were equally influenced by both considerations in their choice of programme.

Employment Patterns

The respondents were asked to indicate their employment status, full-time, part-time, etc., before enrolling at Murdoch, during their course and after graduation. The situation of graduates who had been in full-time paid employment before enrolment is shown in Figure 2. Among this group, the previously fully employed, there was a slight increase in unemployment. On

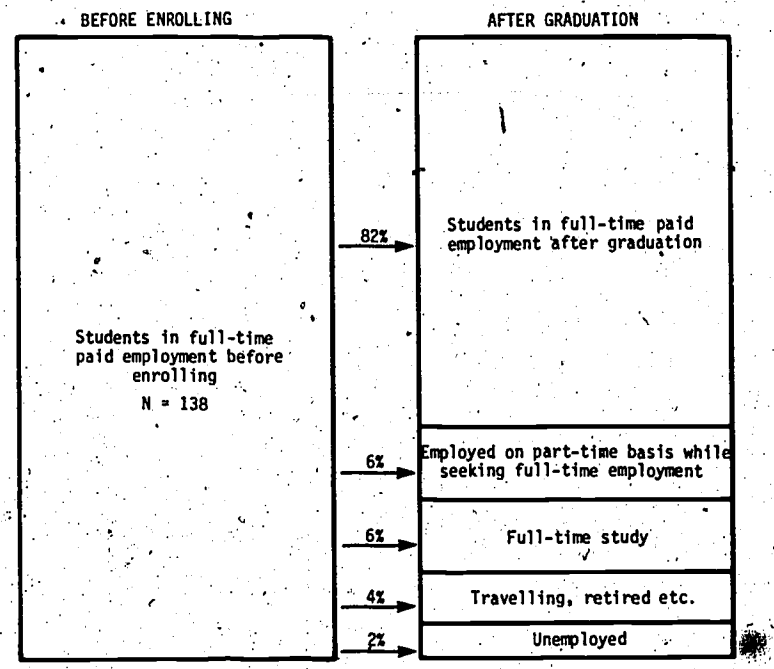

Figure 2: Employment situation of mature age graduates

the other hand, a number of students who had been studying full-time before enrolling or who had been fully occupied with domestic responsibilities had secured full-time work. The proportion of graduates who find employment in any year will be influenced by a number of local and temporal factors. However, it is worth noting that this relatively positive result was achieved by mature age graduates in a period of record unemployment and at a time when the university had yet to firmly establish itself in the local community.

Ten of the respondents had been granted leave of absence in order to study at Murdoch, and a further 19 were granted regular time off to study part-time, with the result that these students remained "employed". The attitude of employers was reported to be either helpful or neutral in the vast majority of cases. Thirty percent of the respondents had resigned in order to study at Murdoch, and since this represents a high level of commitment their subsequent employment is of particular interest. Of the 59 who resigned jobs in order to study, 13 have not returned to full-time employment but the remaining 46 have generally moved "upward" on the employment ladder; while the number employed

as teachers or lecturers remained steady, there was an increase in the number employed in the professions and the arts and a decrease in the number holding jobs not requiring tertiary qualifications. Although employment patterns varied a little between men and women, the same proportion of both sexes improved their employment status.

Finding Work as a Mature Age Graduate

Those graduates who either returned to their previous positions or had continued in that position throughout their course obviously experienced no problems in regard to employment. When asked whether gaining a degree had helped them in their work, 70% of them said "yes", and 68% said it had improved their chances of promotion. Of the 74 relevant cases 62 gave at least one positive answer regarding the effect of the degree on their work situation and 12 made no positive response. Those graduates who sought and gained new jobs at the end of their course (just under half of the total) were asked whether their degree had assisted them in gaining their new job. Seventy-six percent said that it had helped them, 58% that it was necessary for their new job and 68% that it was appropriate for their present duties. Forty-seven percent answered "yes" to all three of these questions whereas 18% answered "no" to all three.

Although it had been suggested that their age would put mature graduates at a disadvantage in a shrinking employment market (Smith, 1979), only twelve of the 90 respondents who had sought a new job after graduation considered that their age had been a disadvantage. These were by no means the oldest students in the group: 11 of them were under 40. Nine of the twelve had previously worked in unskilled or semi-skilled areas before entering university.

In the same way that many students feel that their age gives them definite advantages as students (McDonald and Knights, 1982), many graduates felt that their age gave them an advantage when seeking employment; as one graduate said: "...maturity coupled with experience increases credibility in the market place." A total of 36 respondents believed that their age had been an advantage in job seeking. However, one graduate's comment points out the danger of generalising on this question: '"It differs for different jobs - my present job I got because of my age - others I missed because of my age." For another it was not so much the question of age but the arbitrary nature of employers' age specifications which caused problems: "Employers wanted 'up to 25' or 'over 35'. There I was at 28 with no one wanting to employ me on an age basis - too old for some, too young for others."

Changes of Career Intentions

When asked whether they had changed their career intentions during the course of their studies, approximately 30% stated that they had and 70% that they had not. Those who commented on their reasons for change fell into three roughly equal groups: those whose interests were drawn to another field during the course of their studies, those who found themselves unsuited to their chosen field, and those who felt they were better suited to another. Only 2 of the respondents said that they had changed their course because of anticipated difficulties in obtaining employment.

Was It Worth It?

Graduates were asked whether they considered their original objectives had been achieved. Seventy-two percent said 'yes', 9% 'partly' and 12% 'no'. (7% did not consider that the question applied to them.) There was no significant difference between men and women. Of those who gave reasons for their answer most of the satisfied graduates said that the degree had either already helped them in their career or would do so in future. Another group indicated that they had met their own objectives by the attainment of desired academic goals, from the basic "I wanted a university degree and now I've got one" to those who are now pursuing new or expanded academic objectives encouraged by their success at Murdoch University. However, there was a small number of disappointed graduates - some bitterly so. Six percent indicated that their career objectives had not (or not yet) been achieved. Some of these indicated that the course they completed did not provide the necessary basis for their desired career direction, but they did not indicate whether they had been badly advised or had not sought sufficient information before enrolling. Others completed degrees only to find that the professional requirements they were studying to fulfil had changed by the time they graduated. This operated in two ways - either the degree was insufficient (as in the case of one graduate who then had to enrol for a higher degree) or superfluous (as in the case of a student who earned her degree under conditions of extreme personal hardship only to find that it was no longer a pre-requisite for the course in social work in which she wished to enrol).

With regard to the achievement of personal objectives, there were few complaints. A number of respondents indicated personal satisfaction from completing a degree, or from simply gaining knowledge or being able to complete the course. "My original objective was to see what a university was like, if I could cut the mustard or not. I could, so the objective was achieved." Another graduate confined to a wheelchair considers the degree now wins her more respect from people, particularly those who did not know her before her accident. Yet another said that she considered her objectives to have been achieved: "Because I am now doing what I went through blood, sweat and tears to do. It's still blood, sweat and tears, but it's what I wanted." As well as the positive effects which they had anticipated, or at least hoped for, many respondents reported other changes in themselves as a result of gaining their degrees. The most commonly quoted was an increase in self confidence. As one graduate put it: "I feel more comfortable with the world - less overshadowed." In many cases this was a confidence that applied to the work situation, helping them to feel better equipped to do their jobs or less intimidated by more highly qualified colleagues - as one respondent said: "My knowledge and jargon are up to date." Another effect reported frequently was an intellectual growth, becoming more critically aware of their surroundings. As one respondent, a medical practitioner who completed a higher degree for pleasure and academic discipline, replied: "It has increased my critical faculties, it improved my self image, and it made me a bit of a pompous bore." Another commented: "I feel that I'm much more cynical, especially regarding so-called authorities, experts and academics. This cynicism has either led to or come from a growing self-confidence." Many others also felt they now had a real contribution to make in discussions where they would previously have deferred to "experts". Others commented on a broadened view of life, a wider, more enquiring mind and the ability to think more critically. Comments in this area range from the basic development of new interests and attitudes to the feeling that a whole new world has opened up: "From being confined to one small household, my horizon has broadened infinitely." An increase in tolerance was another unexpected side effect noticed by several respondents, one of whom, a teacher, said that he now had

greater tolerance of innovations in education and greater awareness of the problems of his students. Other graduates considered that they were more relaxed, fulfilled, or just happier. Some of the graduates, whilst making positive comments, commented on stress and tension - particularly strains on relationships with family and friends - but an equal number felt such relationships had benefitted or been strengthened or that family and friends now had greater respect for them.

CONCLUSION

It is important to include these subjective judgments and assessments alongside the description of employment patterns since the employment categories themselves give only a superficial picture. Graduates who have given up full-time but dead-end positions to become mature students may still feel very satisfied with that decision even though at the end of the course they find themselves in the dole queue. The overall employment statistics are encouraging in themselves but the level of satisfaction reported by respondents is even more important. A comparison of motives for returning to study with achievement of objectives indicates a high level of satisfaction on both career and personal grounds. Of those motivated by personal reasons, 90% achieved their objectives and career objectives were achieved by 82%. From this study it appears that mature students have every reason to believe that the sacrifices they make will be amply rewarded. The reputation of mature age students as successful undergraduates can be extended to their situation after graduation where they again score highly both in terms of employment achievement and personal satisfaction.

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Approaches to Individualising Instruction — A Review

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ABSTRACT
Although there is an extensive literature available on individualised instruction and self-paced learning, much of it concerns particular methods and systems. This review looks at the development of individualised instruction, identifies issues and problems common to all variants and assesses the evidence on outcomes in terms of student achievement, student access, costs, and the role of the teacher. It is concluded that: individualised instruction is unlikely to reduce costs; may improve access but not automatically for all target groups; requires a commitment on the part of the teachers to be effective; provides a range of strategies which extend the options available to educators intent on improving teaching and learning.

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INTRODUCTION

A review of individualised instruction or, as it is sometimes called, self-paced learning, presents a number of problems. The terminology used is very confusing. There is no clear theoretical base and the programmes and strategies usually considered as forms of individualised instruction are often different in kind and intention. To cope with these problems I have begun by discussing the terminology used and the development of various approaches to individualised instruction. Next, instead of reviewing in turn the various types of individualised instruction, I have identified and discussed issues and problems common to all the variants. Finally, I have used some of the more reliable evidence available to assess the outcomes in terms of student achievement, student access, costs, and the role of the teacher. I have not concluded by endorsing any particular approach, rather I see approaches to individualising instruction as providing a range of options many of which will be more or less appropriate as solutions to specific instructional problems depending on the context and the intentions of the educators concerned.

Individualised instruction refers to a variety of educational approaches in which, in contrast to traditional group instruction, the curriculum is organised to meet the learning needs of the students on an individual basis. Such approaches have often been called self-paced learning because this was seen as the most significant feature of many individualised programmes, as for example the Keller System of Personalised Instruction (PSI) or Programmed Instruction (PI). However, self-pacing turns out not always to be the most significant feature so that individualised instruction is the more useful term as it provides a wider frame of reference. Individualised instruction itself is an umbrella term with a very imprecise meaning. It really refers to a family of strategies not a strategy. Furthermore, if we look at some types of individualised instruction commonly cited we can see differences in kind, purpose and presumably outcomes. For example: PI (Programmed Instruction), LAP (Learning Activity Packages) and CAI (Computer Assisted Instruction) are the means or resources for individualising instruction; CMI (Computer Managed Instruction) or Contracting are ways to manage the delivery of individualised instruction; PSI and IPI (Individualised Prescriptive Instruction) are coherent systems or programmes of individualised instruction.

Compounding such confusion is the inconsistent use of many terms. PI can refer to a product such as a tape/slide set or a text, but it can also be used as a term referring to the process of a systematic approach to curriculum development. A 'module' can be either a unit of instruction or a package. As a unit of instruction a module is usually taken to mean a self-contained unit of study that a student can work on alone or with minimum supervision. It is short and built around one or two objectives (Goldschmid and Goldschmid, 1973). A subject or course broken into such a series of modules which students can progress through is then called 'modular instruction'. However in a Victorian Technical and Further Education report (AAAC, 1975) we find a different use of the term 'module' which is seen as a much longer and more complex unit of work. This is similar to the use of 'modular' by Quinn (1978) who argues for a change in the U.K. education system to modularisation on the American pattern where subjects are discrete units of 12-14 weeks comprising a course. Thus there can be 'modules' which are the building blocks of a subject and modules which are differently organised subject length units forming a course. In the first instance we have individualised instruction

whereas in the second it is possible to have traditional teaching within the long module.

A further source of confusion is the use of the same terms with different meanings by proponents of different approaches to education. The best example of this is the use of the word 'independent'. Independent learning can mean a student works alone or it can mean that students direct their own learning and study. Many self-paced programmes promote independent learning in the first sense only. Other programmes to encourage independence in the latter sense have moved towards student-directed learning which can involve a range of teaching/learning strategies from field study to attending lectures. Underlying the various meanings of 'independent' is a difference in goals. Is the aim to transmit a body of information or a set of skills as efficiently as possible? Or is the aim to develop the learner's capacity to learn? These questions are related to the issue of who controls the learning process, teacher or student. Adult educators particularly are interested in involving students in making decisions about how their courses are run to meet their needs.

The growing interest in the adult learner as participator in course design and in the learning process is paralleled by a shift in emphasis, interest and concern of many educational psychologists. Much of the early work in individualised instruction derived from behavioural psychology. Cognitive psychologists stress the active nature of learning and memory (Glaser, 1977; Wittrock, 1977). The learner is viewed as an active processor of information who interacts with and modifies the stimuli for learning. This view has led to greater research interest in mathemagenic behaviour and in the development of the skills of 'learning how to learn'.

These changes in meaning and confusions of terminology arise in part from the historical development of individualised instruction. Individualised instruction began as a reaction to the problems connected with large group instruction. These problems are well-known: instruction proceeds at one rate; the teacher spends most of her time imparting information and has not the time to help a student with special difficulties; the quicker students get bored and the slower ones fall behind in frustration; although students have different abilities and prior learning skills they are nevertheless given the same treatment; at the end of the subject some students, usually the higher achievers, have made progress and others have not; on a course level the students are all expected to undergo the same treatment for two or three years despite differing individual, personal and vocational needs.

By contrast in individualised instruction the starting point is that every learner is unique and the instructional programme must adapt to the learner. To do this ways are sought to present instruction to students in some form other than lecturing or teacher talk which demands group instruction, so that the teacher can address individual needs. Many of the early individualised instruction programmes began with the idea that learners were different particularly as regards rate of learning. From this arose programmes to allow students to work at their own pace. However, this approach soon came under much criticism because it was seen that although the student now controlled pace (and even that is questionable in PI) everything else was teacher controlled and in fact could be said to be more highly controlled because it was more structured than ever before. If individualisation is always accompanied by detailed task specification it may actually deny an individual even the degree of independence implicit in the anonymity of the traditional class (Dressel and Thompson, 1973).

One way to counter such criticism and the problems that arose in implementing such programmes was to vary more than pace, particularly learning routes or teaching strategies and types of presentation. Such moves to develop learner-centred programmes were more in line with the oft repeated claim that this would produce the motivated independent learner. It led logically in some cases to attempts to offer the student choice, not only of pace and learning route, but also of objectives and assessment. For if the aim was to meet student needs, then presumably not all students in a subject or course wanted the same outcome, and if they took different learning routes they might appropriately require different types of assessment. Different learning routes could involve group work for it was clear that some students do not prefer to work alone. This development was strengthened by criticism from those in the humanist tradition (e.g. Rogers) who were concerned with social interaction and personal development. They saw much of individualised instruction as dehumanising and spoke of the need to personalise and humanise teaching. For them individualised instruction was more of an attitude or philosophy of education (Keuscher, 1975; Turney, 1973).

The meaning of 'independent' changed from usually meaning 'alone' to meaning more often 'self-directed'. This change strengthened the claim that individualised instruction was for creating independent, i.e. self-learners, and for some this became the most important aim. With this came a change in the meaning of the concept of the teacher. At first the teacher was seen as the manager of learning, which term can conjure up pictures of the teacher as a master mind organising all the details of the teaching-learning situation to maximise students' productivity. But with the change in emphasis towards student-directed learning 'manager' sounded too directive, even manipulative. A student directing his own learning needs a facilitator rather than a manager. The facilitator helps the student decide on his objectives and programme and acts as counsellor, tutor and resource.

The developments that have just been presented represent a shift in thinking, but not on the part of all educators. The developments outlined are not strictly chronological: criticism of some forms of individualised instruction as being mechanistic and too prescriptive were made from the start. What we are left with in practice is a range of programmes which can be seen to lie along a spectrum that ranges from complete teacher control of the components of teaching and learning (objectives, pace, strategies, assessment) to complete student control (Boud et al, 1975; Gibbons, 1971; Brabner, 1973). This spectrum should not be confused with a progression from teacher control to student control with student control of all components being the ultimate goal. Different degrees of control of the components of teaching and learning could be appropriate in different circumstances. For example, in a course on using explosives safety demands highly prescriptive procedures; there is no room for discovery learning. However in a discussion of a 'Unified Vocational Preparation' for pre-employment courses (F.E.U., 1978) a prescriptive approach that could be organised in a controlled, phased way so that students are almost certain to learn is rejected because:

> Apart from the requirement for the young person to place himself entirely in the hands of his tutor, and thus tend to develop a relationship of dependency, it confirms him or her in the conviction that learning is a process organised by 'someone who knows better', it does not help the growing person to learn how to learn from his or her own unorganised experience.

ISSUES AND PROBLEMS IN INDIVIDUALISING INSTRUCTION

Although the identification of a spectrum from student to teacher control enables us to distinguish degrees of prescription in specific programmes it is not a sufficient basis on which to organise a discussion of the issues involved in individualised instruction. We are not looking at a group of distinct teaching methods but at strategies, materials and systems that can involve an extensive range of educational expertise and issues such as the use of media, whether to use objectives, human relations and so on. To establish some order out of this variety the discussion of issues and problems that follows is organised around what are seen as four key areas of decision-making for a teacher individualising instruction. These are:

* How to organise instruction
* How to present instruction
* How to assess student learning
* How to manage the teaching/learning environment.

THE ORGANISATION OF INSTRUCTION

The organisation of instruction raises questions concerning objectives, unit structure, and sequencing.

In many forms of individualised instruction a subject or course is broken into discrete instructional units which are sequenced in some way and presented in a form accessible to the student. The student then works through the units. The instructional units are referred to by this name or as modules. The notion of breaking up a subject into bits came from PI but units in most individualised instruction programmes are bigger than PI frames. Experience seems to show that this organisation of instruction can be appropriate for subjects that are composed of heirarchical skills, that are cumulative and can be presented in a linear form as can some mathematics. The unit organisation will also suit subjects that can be broken into discrete sections as can geography. But it is less clear that it suits all subjects. Northedge (1976) cites study skills as an example where mastery of all such skills does not necessarily mean the student can write well. Other teachers worry that breaking a subject into units threatens integration and additional units are needed in order to draw it together again. It could be that the problem is how units are created rather than the division itself (Bridge and Elton, 1977). To organise this way means modifying the notion of 'coverage'. To many this is no problem because in most traditional courses 'coverage' means that the teacher talked about or referred to so much subject matter but the student usually learnt a great deal less. In most individualised instruction programmes the student is meant to learn all that is presented so that the teacher has to decide in advance what is essential and put only that in the units. Boud et al (1975) estimate that a PSI presentation covers a third less than a traditional presentation of the same subject. The advantage of this is that now the student learns more thoroughly what is important. The disadvantage is that the student may have less choice than in a traditional course as to what he learns. Some teachers try to get around this by structuring the course with core and optional units (Cohen and D'Iverno, 1977).

It is often stated that instruction within units, and the units themselves, ought to be sequenced logically into a step-by-step path. This viewpoint

derives from the experience of PI, and its underlying behaviourist theory, where instruction was arranged in small steps. It has been supported by the learning hierarchy theory of Gagné which advocates sequencing learning according to a hierarchy of pre-requisite skills, and the systems approach to curriculum development where sequencing a prescriptive learning path seems a logical step once the objectives were established. However there are a variety of ways to sequence instruction and units. In an experiment Mager (1961) gave students control of learning and showed that the sequence followed by learners was not the same as that which an instructor would normally follow. The students did not begin with basic theory but asked about the whole and then proceeded to the parts which Mager summarises as moving from a simple whole to a complex whole. Another approach to sequencing is the 'spiral learning' of Pipe (MacIntyre et al, 1974). A student is given an overview of a whole concept then taken in a series of passes through the material adding more detail, qualifications or exceptions until all the refinements have been introduced. There are other considerations in sequencing: a tight sequence will inhibit attempts to give students choice in units to be studied and make it more difficult to allow students to enter a subject or courses at different levels. The tighter the sequence the more likely that students will be doing the same thing at the same time which could create management problems (Pucel and Knaack, 1975). There is no firm evidence that any method of sequencing is always superior (Hartley, 1974; Horan and Lyn, 1980). It seems likely that there is no one correct sequence but rather different possibilities. The real problem is when units are so tightly structured that the teacher is likely to be imposing her structure of thinking on the students which can inhibit learning. This is why a programmed text can be more rigidly prescriptive than teacher-directed group instruction.

In many individualised instruction programmes each unit of instruction has clearly defined objectives. In vocational and technical education the units are often structured round objectives derived from job and task analysis. The debate on the desirability of objectives, and particularly behavioural objectives and their effectiveness in facilitating learning, continues (Duchastel and Merrill, 1973; Davies, 1976; MacDonald-Ross, 1973). Critics see the objectives approach as producing an 'ends dominated' view of course design, a closed system of knowledge. Proponents argue that objectives clarify the purposes of education and help the students' learning by showing them what they must achieve. It may be that the matter is not altogether an either/or issue. Objectives can be used without prescribing all students' learning outcomes. Students can be asked to formulate their own objectives or asked to choose from a set of given objectives those of importance to themselves as has been done in a range of programmes from graduate courses to training programmes for press operators and tool and die makers (Cornwall, 1976; Johnson and Ruskin, 1977; Warren, 1978). Objectives do not have to be behavioural, they can be expressed as hypotheses or be experience-referenced (Davies, 1976; Charles, 1976).

As regards the facilitation of student learning other issues are involved, in particular the implications of information processing theory for instructional development from which there are as yet no clear guidelines for action (Low, 1980).

PRESENTING INSTRUCTION

Presenting instruction requires the teacher to make decisions as to media and teaching strategies. In some programmes, particularly PSI, the subject is presented with written materials, rather like a correspondence course. As with textbooks they can be hard for some students to study so that study guides or questions along with objectives and self-tests may be included. Programmed texts are an even more structured version. The obvious problem with written materials is that the reading level may not be appropriate. Work is being done on learning from texts (McConkie, 1977), information mapping (Hartley, 1978) and other ways to assist the reader by making the structure clear with flow charts, diagrams and carefully designed layout.

Not all information is best presented in written form, nor do all students prefer this style of presentation. Other programmes have developed multi-media approaches with programmed books, task simulators, tape/slide sets, films and filmstrips, models and so on. Earlier research tried to determine the effectiveness of the media alternatives. Romiszowski (1978) concludes that research on alternative media has been generally inconclusive. Differences have usually been traced more to the intrinsic quality of the particular product, a well-written book or a well-made film, rather than to general characteristics of the medium which can in some ways be matched to learner characteristics. The more pertinent questions to ask are to do with the appropriateness of various media for specific purposes; for example, highly detailed factual information is suitable for printed material whereas television and film can be used appropriately for teaching motor skills where the medium's ability to slow down high speed action, repeat movement and give close-ups is used to advantage (Campbell, 1981).

Another approach to presenting instruction in individualised instruction is to develop packages or modules round objectives and topics. A module as a self-contained, independent unit of planned learning activities can include a variety of media such as tape/slide kits (Goldschmid and Goldschmid, 1973; Murray, 1971). A module presents only a few objectives and can be very short (Burns, 1974, suggests 1-3 hours work). Modules are organised on a functional basis integrating theory and practice in subjects requiring practical work.

Looking very similar to a module as a mode of presentation is a Learning Activity Package (LAP). A LAP has a list of objectives, specified activities and post-tests (Chastain, 1975). A LAP can provide a variety of activities and resources, and activities may include visits into the country or talk with peers on practical activities. As regards the internal structuring of packages, modules or LAP's, the same considerations about sequence already discussed apply. Most educators advocate allowing students a choice of activities and resources to allow for more than one learning route (Musgrave, 1975). There is little research on modules and LAP's. One study of high school students showed that although performance was the same, students preferred the LAP with choice of learning activities (George, 1976). The advice of Tunks (1975) points to problems with the undiluted use of LAP's: he suggests using LAP's only two, three or four out of five days and structuring-in the group activities.

Some advocates of individualised instruction did not see it as a strategy in itself and developed the possibility and logic of using a variety of teaching strategies for different parts and aims of a subject or course. The most well known approach was the audio-tutorial method developed by Postlethwaite (Creager and Murray, 1971). This method is suited to subjects with a mixture of theory and practical work and has been used at Sydney

University by Brewer. In her botany course the theory is presented to students in individual carrels by tape-slide along with plant materials and equipment for doing practical activities related to theory set out in a study guide. Weekly group tutorials focus on problem-solving skills (Brewer, 1977).

The need to provide more than one learning route in packages has been mentioned. This is a recognition of the evidence that students have different learning styles. There are many models of learning styles available: such as field-dependents and field-independents (Witkin, 1977), convergers and divergers (Hudson, 1966) serialists and holists (Daniel, 1977). The problem for the teacher is that although each model makes sense and there is clearly some overlap, we do not have a working theory of how students learn which can integrate all the different models of learning styles with learning theories (behavioural, information processing, cognitive psychology) and learning strategies to guide practice. This lack of a working theory of learning styles and strategies makes it difficult to design materials or packages to match individual students' learning preferences which might otherwise be the logical next step.

A more basic objection to designing materials for different learning styles and strategies is that there is evidence that learning style preferences change from task to task. Hunt (1977) gives as an example the teaching of statistics by a programmed text. A student whose previous experience of mathematics or statistics has been characterised by failure may prefer to learn in a highly structured setting where he is given continuous positive reinforcement from each response he makes. But another student may find these same characteristics restrictive and boring. Such a student may need an unstructured environment with little overt help where she is presented with a clearly defined challenge to find a solution to a problem.

Laurillard (1979) supports this idea that student learning styles and strategies are context dependent and gives as factors influencing choice of strategies and styles of execution, the students' orientation towards the task and their perception of the task itself. Similarly studies of the interaction of students' personality and PI show that the perceived difficulty of the task interacts with anxiety and intelligence (Dallos, 1976). We are dealing it seems with interactions more complex than can be handled by matching styles or personality traits with teaching-learning strategies or learning materials. The evidence suggests that closely integrated and carefully constructed texts may have inhibiting effects on student learning (Brew and McCormick, 1979) and the same could be expected to be true of packages as the style and strategy chosen by the teacher is probably the one that suits her personally and not necessarily all the students. Moreover, the more tightly constructed the materials or packages the less room there is for students to modify and adapt activities and materials to suit their preferred approach.

A further consideration is the instructional context in which resources such as packages are introduced. Much of the early development of individualised instruction was resource intensive and media oriented. The products were seen as separate from teachers, neutral components in the classroom and largely independent of the teachers. However, there is evidence that the conditions of learning affect student outcomes however well constructed the resources. In a study of the use of a learning package with a computer, (Elton and Laurillard, 1979) the following conditions are listed as affecting performance: 'student preparation for the package, interaction of the package with lectures, the logistics of computer use, the role of the

academic staff, the assessment of computer related work - all these and more!. There is increasing interest in the learning environment rather than in resources as such. Individualised instruction is more than putting content into packages or units: the way these packages are used is equally important. This interest is supported by work on how students learn. Cognitive learning theory sees the student as actively engaging with materials or stimuli to create meaning. This process can be facilitated so that emphasis is shifting from the investment of resources in the development of instructional materials to investment in the instructional environment (Rothkopf, 1977).

It is worth looking briefly at CAI here as its use relates to two important issues: how to meet an individual student's learning needs without developing separate materials for each student (an impossibility) and the teaching models implicit in any given resource or package. What is interesting with CAI is that researchers and developers, perhaps because CAI has been used as a research tool for studying learning, have been more aware of the assumptions and implicit teaching-learning models underlying different uses of CAI. This is in contrast to much of the writing on LAP's, PI and other individualised instruction programmes that is often distressingly superficial. Some developers of PI and later individualised instruction variants assumed that because students were not following traditional large group instruction a revolution in teaching had been achieved. But Howe (1978) sees PI and CAI, when it concentrates on drill and practice, as based on a model of teaching that is talk/chalk and question/answer. The difference is only in the medium. Looking at applications of CAI with micro-processors, Howe and Boulay (1979) see each programme as located on a dimension that ranges from 'learning by being told' to 'learning by discovery'. They see drill and practice as an abuse of the potential of educational technology. The significant point about such reviews of CAI is that the medium is not seen to produce of itself a different teaching-learning model. Whether the students are using CAI or kits, packages, tape/slide sets or written assignments in class, nothing very different in terms of the relationship between the teacher and the student needs to have taken place. What happens will depend on how CAI is used for instruction.

One development that may hold promise of more radical change as regards learning strategies is interactive CAI with cybernetic strategies of programming. In a conversational mode the computer is programmed to learn from the learner as well as to teach. The computer learns to interpret individual learning strategies and preferences for teaching style and adapts the presentation accordingly (Remiszowski, 1978).

ASSESSING STUDENT LEARNING

In most individualised instruction programmes assessment is seen to have two functions: diagnostic before and during the course/subject, and summative at the end of each unit and subject. Assessment during or at the end of units is used to determine progression. Basic to the use of assessment in most individualised instruction programmes is the concept of mastery. Students are not exposed to a subject and then assessed on normative measures and ranked, instead tests are criterion-referenced; that is they test for specified objectives which students are expected to master. Mastery is usually set at 80% or 90% achievement and the students re-do a unit or go through alternative instruction until they can reach the desired standard.

'Mastery' as a concept derives from Carroll's (1963) model of learning in which

aptitude = f(time spent on a task/time needed).

A corollary is that if given the time all students can achieve mastery. While this implies complete or maximum learning of a subject or unit as the objective, in practice it often means a minimum level of competency for unit progression or for passing a course. In vocational and technical education the criteria can be competencies that are based on occupational analysis. This leads to competency-based or performance-based approaches which often involve some degree of individualised instruction. Mastery thus involves two key ideas:

* that assessment be criterion or performance referenced;
* that given time all students can master the objectives of a unit/subject (allowing for quality of instruction).

Where the assessment criteria are operationalised as behavioural objectives, difficulties may be raised as discussed previously. The concept of the centrality of time also raises some questions. Although in theory all may achieve mastery if given enough time, it may not be feasible in practice.. Pucel and Knaack (1975), in discussing technical and further education, see time taken to complete a job as an imporant part of vocational assessment which would not allow time to be completely elastic. The question of the interrelationship of time and learning has been closely studied in recent years. In a review of studies of learning as a function of time Frederick and Walberg (1980) suggest a non-linear relationship among time and other factors. It is becoming clear that what a learner is doing in the time available may be more important than the amount of time available (Shimron, 1976; Levin et al, 1980).

In aptitude-treatment studies researchers have examined the relationship between aptitude and achievement for individualised methods allowing variable time available and requiring mastery, and for conventional methods. The results do not support the mastery model predictions that aptitude-achievement correlations will be lower for such individualised methods. In meta-analyses of PI, PSI, CAI and the audio-tutorial approach the effect on the aptitude-achievement correlation was very small at best (Kulik et al, 1979a, 1979b, 1980a, 1980b). Kulik et al (1979) conclude that: 'Individualised instruction, in which students are free to vary the time and manner of learning, does not seem to narrow the gap between gifted and disadvantaged learners'. There can be practical difficulties in translating the concept of 'mastery' practice. Where units are cumulative, mastery of successive steps only adds up to mastery of a subject if the analysis into specific tasks is good and complete (Bridge and Elton, 1977). Mastery is usually and logically accompanied by student-pacing. Where pacing is partially or wholly teacher determined, decisions will need to be made about what is to be taught and 'mastered'. One solution offered is:

> to consider carefully the amount of material in each unit in the courses, so that a majority of students are likely to learn most of it, and to provide more than one chance within each unit for students to see how they are doing and if possible do better (Cryer and Manwaring, 1977).

Most forms of individualised instruction involve continuous assessment. Often there is no end-of-subject or course examination although end-of-course examinations can still be used. In some cases a form of contract is made with a student to formalise a procedure of continuous assessment. It can be agreed beforehand that if the students do 9 of 11 basic units they get a C, if they do 11 they get a B, and if they do a

special extra project they get an A. In some courses points are given for completing certain pieces of work. This is a system reminiscent of piecework payments in industry and the comments of Elton and Laurillard (1979) on the place of grades or marks are relevant. They suggest that although students will not work for no marks, after a certain point extra effort will be forthcoming only if intrinsic interest is engaged. Contracting is indeed an attempt to generate motivation and can be seen as an aspect of classroom management rather than assessment as such.

Whatever the method of continuous assessment used, monitoring student progress throughout a subject or course requires extensive record keeping. Records often comprise detailed student profile cards and their maintenance can put a large clerical burden on teachers. One solution advocated for this is Computer Managed Instruction (CMI). In CMI the student does not interact with the computer, it is used to manage instruction. However, the role of CMI can be more than straight record keeping. It can mark teacher constructed tests, and on the basis of these marks and others, record details of the student's basic skills level, interests, career intentions and any other details, route the student to a new task or teacher, or to repeat all or part of work just completed. This 'routing' is done by a personalised message produced from a store of comments. The computer stores a record of the tests and routing instructions and can produce a full report for the teacher of any student at any time (MacMahon, 1978). An example of this is given by Cross (1976). At the Miami-Dade Community College in Florida a response system with variable prescriptions (RSVP) is used for students at home or on campus. For each module in the RSVP programme a student takes a ten item multiple choice test. RSVP analyses the patterns of response and identifies for the student whether he missed a main idea or question. The student is then directed to certain portions of a TV documentary page in a textbook or section of a learning module. RSVP can report results on an individual and cumulative basis. Although the programme was rated a success by students who were mostly older and off-campus, Cross cautions that questions about the use of objectives, the validity of the prescriptions and the usefulness of feedback to teachers remain to be answered. In other words CMI improves the efficiency of the delivery of certain types of individualised instruction but questions about their effectiveness remain unanswered.

MANAGING THE TEACHING/LEARNING ENVIRONMENT

Managing the teaching/learning environment involves considerations of classroom management and logistics. Aspects of particular significance are timetabling, pacing, withdrawals, student characteristics and group group. In some individualised instructional programmes students meet in usual classroom hours but instruction is individualised within that time period. In other programmes self-instructional materials are available under supervision for large periods of the week so that students can choose their own time to attend. Sometimes these materials are available as a supplement to other class work (Manwaring, 1977) or the entire course is available this way (McClelland, 1977; Lambrecht, 1972). One programme in automotive mechanics had pieces of equipment in carrels with tape/slide kits which were available all day to allow every student experience with handling equipment which was not possible in conventional demonstration/practical classes (Hunter, 1974).

An important issue to be considered is how the work should be paced. In some

of the early writings it was suggested that self-pacing was an integral feature of individualised instruction. Some authors thought that once students could learn at their own pace motivation would improve as well as achievement. Organising instruction to allow for student pacing was thus seen to be highly desirable. There has been a lot of research conducted of relevance to the question of pacing, especially in relation to PI and PSI. Both these approaches have been researched as to outcomes of component features as well as the approach as a whole. Studies of PI do not support the expectation that student pacing will improve performance over scheduled instruction (Impetterelli and Finch, 1971; Campeau, 1974; Leith and Tobin, 1968). Hartley (1974) further suggests that in PI whilst the learner has some control over the pace of her work, the overall pace is determined by the person who wrote the programme and who decided the size of learning steps and graduations according to difficulty.

In PSI student pacing has been called 'one of the most integral components of the PSI format' (Ruskin, 1976). However, a review of some 39 studies of PSI which includes a thorough component analysis concludes that student pacing is not necessary for PSI to be effective (Robin, 1976). This conclusion is supported by other reviewers (Kulik et al, 1976); Johnson and Ruskin (1977) suggest that although student pacing has no effect on examination performance, it could have benefits (which have not been investigated) for the teaching of self-management skills. However, the most noticeable and persistent problem with PSI is usually cited as the large amount of student procrastination and the high rate of student withdrawal (Robin, 1976; Johnson and Ruskin, 1977; Kulik et al, 1976; Boud et al, 1975). This would suggest that initially at least not all students display such management skills.

The question of withdrawals from PSI courses is not clear-cut. In a recent study Kulik et al (1979) carried out a meta-analysis of the results of 27 studies of PSI and found no significant difference between PSI and conventional courses in this regard. This finding is contrary to that of the other studies cited. One explanation for the apparently discrepant results could be that educators expected that student pacing would improve the achievement and retention of the usual 'failing' group of a conventional class; the emphasis in the literature on the facts of withdrawal reflects the failure of these expectations. Procrastination may be a problem in all courses which is made explicit in PSI. Keller himself (Ryan, 1974) suggests that not all students can be expected to pass.

To cope with problems of procrastination many PSI courses have been modified by the introduction of deadlines through the course, charts of student progress and other management strategies. Such limiting of student pacing does not seem to affect achievement (Robin, 1976). However it may mean that other possible benefits of student pacing particularly that of teaching self-control and self-management (Robin, 1976; Morris et al, 1978) are lost with no certainty that the problem is solved, given that the precise nature of the interaction of PSI components and their association with procrastination and withdrawal has not been established. Furthermore, those students who cope and thrive are in turn disadvantaged. In individualised programmes other than PSI, student pacing has been limited also. In vocational and technical education Pucel and Knaack (1975) recommend some teacher control of pacing because: 'Complete student self-pacing assumes that all students will be sufficiently motivated to pursue their learning at their own best rate and that all of the learning materials will be equally self-motivating. This assumption may not be true.'

Some teachers in science-based subjects at university level as reported in Bridge and Elton (1977) have also set up teacher paced courses where the students have the freedom to control their own work for a week or less, but work on materials specially prepared for individualised study allowing the teachers time to provide tutorial help. This type of teacher pacing allows for other arrangements such as concurrent tutorials or group viewing of films, and where live materials are used is a practical necessity. This is the type of pacing used by Brewer in the Botany course mentioned earlier. Of interest here is a study of Open University students. It might be thought that courses of this type are student paced, but it was found that students organised themselves round assignments so that the courses are more accurately described as teacher paced self-study (Aspden, 1977).

The experience of individualised instruction seems to suggest that not all students who come to various forms of individualised instruction develop the necessary attitudes, skills and motivation. The following are given as needed behaviours for the success of a LAP programme: self-direction, respect for others, group co-operation, self-confidence, self-evaluation, leadership and self-initiative (Smith and Kapfer, 1974).

Some students do not have these characteristics. Charles (1976) talks of 'drifters', students who have difficulty beginning work and keeping at it, who are easily distracted and take little initiative. He concludes that these students are unlikely to benefit from individualised instruction. These students appear similar to those identified as teacher dependents in vocational and technical education (New Hampshire, n.d.). Such students do not want to make decisions and look to their teachers or peers waiting to see what to do. Just how many students at which level of education fit this category is not clear. Cross (1976) in a book on 'new' students (those admitted to American Community and Junior Colleges under open admission policies) sees them as more likely to procrastinate and withdraw from PSI courses. It is clear that motivation is important and is not necessarily either stimulated or strengthened by the mere fact of introducing individualised instruction or student pacing as much of the earlier literature would suggest. Nor can all students be expected to come equipped to use self-instructional materials. Some assistance in learning how to learn may be needed. Recently at the university level where much work is done outside of class contact hours, there has been a great interest in teaching study skills to students (Hounsell, 1979). 'How to learn' and 'self-management' skills would appear to be not outcomes of individualised instruction but rather prerequisites.

In many programmes such as PSI and PI students usually work on their own. PSI has built into it more tutorial help with the use of student proctors and some see this as the humanising element that makes PSI work. Others have criticised individualised instruction charging that an over-emphasis on independent study can lead to boredom and aimless activity. In a study of competitive, co-operative and individualistic goal structures and their effects on instruction (Johnson and Johnson, 1974), it was concluded that individual structured situations (PI and mastery programmes) are appropriate for learning specific cognitive materials and skills but that lack of interaction among students may produce feelings of loneliness and isolation thus blocking the development of interpersonal and group skills.

Group activity is called for too when the goals of the course, or the nature of the learning activity, demand it. For example, in a training programme

for men repairing photocopiers, the programme was organised into self-paced units except for the last unit on customer relations which demanded interaction and strategies such as role-playing. Despite difficulties in timetabling, this unit was designed as a group activity (Horner, 1973). Group activities can also be included for other purposes. Bloom (1971) cites as the best procedure to make use of feedback, small group study sessions of two to three students who meet for an hour per week to review formative test results and to co-operate to overcome difficulties identified in the test. Leith (1969) did a study on using PI that showed superior attainment of small groups (15) over individual instruction. Even in mathematics which may seem especially suited to individual study, a system of prescribed study for mathematically precocious students has been developed where students work in groups. Stanley (1980) thinks that such students need the appropriate level and pace of mathematics not as sit-in-the-corner independent studiers, but in the company of several other students who are also able and eager.

The above indications that some small group work and peer and teacher interaction are necessary will not surprise students of distance teaching. It is to overcome the lack of contact that correspondence students are brought together for study weeks. Morris (1977) notes that: 'The greatest difficulty facing an Open University student is his isolation from others studying the same course. There is no-one to discuss with, none to ask questions of, none to see when further explanation is required.' Discussing another distance education course, Aylward and Barclay (1970) also stress the problems of a student working alone: '... he can spend hours wrestling with a minor point that an internal student may have clarified in a minute by asking his tutor or another student.' In many individualised instruction programmes, the teacher sees the programme as freeing her to give just this sort of tutorial assistance more effectively than in conventional teaching, however, this role needs to be stressed. Chastain (1975) warns that: 'Individualised instruction which is indistinguishable from a continuous series of classes or supervised homework in which everyone is given the same assignment bears slight resemblance to the promised package inherent in the term individualisation.'

OUTCOMES

Evaluating the outcomes of such programmes is difficult. Much of the earlier research was poor in quality and consisted of comparing some mode of individualised instruction, usually not fully explained, against traditional instruction which was often not described at all. The lack of any description of the context often makes it hard to tell whether what is being evaluated is a component resource in a classroom, a new teaching strategy or an instructional system. Conflicting results and reports of no significant differences are common. More important than the lack of conclusive results are the more fundamental defects of much of the research. The problems of implementing innovations are well documented and they relate to the context and the people involved. In an experimental design the researcher who reduces complexity for the purpose of controlling variables often eliminates the very complexities and interactions that are significant for evaluation. A further criticism of research into individualised instruction is that it has frequently used group measures to evaluate strategies designed to encourage individual achievement. Macken et al (1980) in a discussion of evaluations of CAI, point to instances of incorrect conclusions being drawn because global analyses do not consider all the relevant factors. They conclude: 'Such evaluations can essentially penalise an individualised

programme for being individualised.' There are also gaps in the research evidence available: for example, packages (LAP's, modules) have attracted little attention.

Given the problems and gaps in evidence the discussion that follows is inevitably patchy and inconclusive. The literature contains a lot more about how to and what ought to take place than solid evidence that educators' aspirations are being realised. The discussion here relies mainly on review articles which draw together the results of a number of reasonably well designed studies, reviews of individualised programmes that have been subject to component analysis, and the results of meta-analyses.

Student Achievement

Programmed instruction was one of the earliest attempts to present 'self-instructional' materials that allowed students to progress at their own rate and usually alone. The essential principles of PI were seen as small steps, active student involvement, immediate reinforcement and self-pacing. Materials were presented in a programmed text or through a teaching machine or on a tape-slide. Later programmes were presented in a package that could include a variety of materials. Hartley (1974) provides a detailed account of the basic principles of PI: these principles are often cited as if they were 'laws of learning' and Hartley suggests that they may have had more influence than PI itself. The results of studies to measure the effectiveness of PI indicate that it can teach at least as well as conventional approaches (Dodd, 1967). However, after a review of studies of PI in vocational and technical education, Impetterelli and Finch (1971) conclude that while PI is as good as 'conventional instruction' if that conventional approach is oriented toward classroom type (cognitive) objectives, complex 'perceptual motor activity' integrated with problem solving might better be taught by other means. Cross, (1976) claims that the research findings fall short of justifying the investment of money, time and personnel needed to produce programmes of high quality. Although PI is usually seen as of limited use for routine teaching of facts and skills (Davies, 1971; Cross, 1976), programmes can apparently be developed that do more than this. Romiszowski (1979) states that it is possible to programme mathematics to teach by the discovery method. However, such a use of PI would now involve CAI which would be seen as a more sophisticated and adaptive development of PI.

In a meta-analysis of studies of PI Kulik et al (1980) while concluding that the achievement gains by students were small, noted that studies in the early 1970's reported more favourable results than those in the early 1960's. They suggest that this is because PI has been used more discriminatingly in recent years in areas where it can contribute most.

PSI or the Keller Plan (or Behavioural Instruction, as it is often called) was developed according to behavioural principles of learning. Its four main components are: self-pacing, mastery, frequent feedback and peer proctors. In a PSI course the normal pattern of classes is replaced with prepared written units of work and tests. Students work at their own pace and as soon as they believe they have covered the work they present themselves for a test scored at mastery level. Once they pass they go on to the next unit, otherwise they study the work again and do another equivalent test. Tutoring for students is provided in American courses by student proctors. Lectures and demonstrations are used for enrichment and motivation purposes as well

as to provide classes with group activities. Attendance at these is voluntary. PSI has been used for a wide variety of subjects (psychology, economics, physics, engineering, mathematics, library sciences, sociology) particularly in the U.S.A. but also in the U.K. and to some extent in Australia. It is also one of the most thoroughly researched of all teaching methods. The evidence for its success in improving academic achievement seems incontrovertible. Robin (1974) cites 39 studies out of which 30 showed significant differences in favour of Behavioural Instruction (BI). These findings are supported by other reviewers of research (Cross, 1976; Kulik et al, 1976; Kulik et al, 1979a; Schiller et al, 1980). In a meta-analysis of outcome studies Kulik et al (1979b) conclude that PSI generally produces superior student achievement and that this superiority can be demonstrated in a variety of course settings. There is also evidence that learning from PSI is not shortlived (Robin, 1976; Kulik et al, 1976) and that students have consistently had favourable attitudes to PSI (Robin, 1976; Boud, 1975; Kulik et al, 1976).

In a component analysis Robin (1976) indicates frequent testing, proctoring, unit perfection requirements and study objectives as contributing to the effectiveness of BI but not self-pacing and optional lectures. It is clear that it is in the interaction of various features of the programme that its success lies. It seems advisable for teachers using PSI for the first time to use the complete set of strategies as the basic features form a logical coherent structure (Ryan, 1974; Cross, 1976; Johnson and Ruskin, 1977). For example, since PSI sacrifices breadth for depth of coverage, mastery is essential (Robin, 1976).

PSI is a good deal more flexible than PI. The evidence on the effectiveness of using proctors is not conclusive (Robin, 1976; Kulik et al, 1976) but the discussion sessions with students when materials are tested, which the presence of proctors allows, gives the student rapid appropriate feedback, compensates for any deficiences in the learning materials, allows for discussion and enquiring beyond the unit work and gives feedback to the teacher on the basis of which she can revise materials. In a PSI course proctors also provide human interaction and responsiveness. One potential limitation of PSI is the heavy reliance on the written word. Students need an average to above average reading ability (Johnson and Ruskin, 1977; Boud et al, 1975). So far PSI has been mainly used at the university and college level and it is not clear whether the heavy reliance on the written word confines its applicability to above average students.

Although the school experience differs from that of post-secondary institutions in many important aspects, it is worth looking at the experience of individualised mathematics instruction in the school because there has been a large amount of research carried out in relation to it and, in the case of IPI (Individualised Prescriptive Instruction), individualised instruction has been conducted over a considerable period of time so that the novelty vis-a-vis other methods has worn off. A series of reviews of research studies shows little difference overall in the results for traditional and individualised approaches (Dengate, 1980; Kulik, 1980; Miller, 1976). Romiszowski (1979), in a review of individualised instruction in mathematics, questions the results and conclusions of Miller which he sees as being inconclusive. But he argues that the investment in the U.S.A. in the prescriptive individualisation of mathematics has not really paid off. He suggests that the finding of Miller that the large institutional application to a whole school district of individualised instruction resulted in student achievement deteriorating with time can most

likely be accounted for by the teacher variable. He cites two other cases of individualised instruction programmes where a decline in standards was traced to lack of teacher interest or competence. This suggests the need for caution before moving to a widespread application of any one teaching approach. Once it is extended beyond the enthusiastic pioneers any innovation becomes subject to the very factors that account for traditional approaches being implemented at less than maximum efficiency and effectiveness, such as teachers and students who are unsuited to or uninterested in the teaching approach.

Meta-Analyses of Individualised Instruction

In recent years researchers have sought to overcome the problems associated with a never-ending stream of studies with conflicting results that offer little guidance or conclusive evidence. Methods of research integration and in particular the technique of meta-analysis are being developed to allow firmer conclusions to be drawn from large bodies of conflicting findings. Kulik and others have carried out meta-analyses of studies in individualised instruction and have published an overview of their findings (Kulik and Kulik, 1980) as well as separate meta-analyses of PSI, PI, Audio-Tutorials and CAI. Their overall conclusion is that individualised instruction has a positive effect on student achievement at the college level though the effect is small. Achievement gains were positive but small in PI (Kulik et al, 1980), audio-tutorials (Kulik et al, 1979b) and CAI (Kulik et al, 1980a). However the gains in student achievement with PSI (Kulik et al, 1979a) were greater. Not only did PSI have a positive effect on student achievement but the effect size was 0.5, which Kulik et al translate as meaning that the final examination score of a typical student in a typical class would be raised from the 50th to 70th percentile. Where the teacher variable was controlled by having the same teacher present instruction to the control and experimental groups the difference between the effect of using conventional or individualised approaches was smaller. Kulik et al (1980) suggest a possible explanation for this:

> It seems possible that involvement of teachers in innovative approaches to instruction may have a general effect on the quality of their teaching. Outlining objectives, constructing lessons, and preparing evaluation materials (requirements in both computer-based and personalised instruction) may help teachers to do a good job in their conventional teaching assignments.

The difference between experimental and control groups was also less in those disciplines thought of as the hard sciences. Kulik et al suggest that subjects which are less structured benefit more from the application of good teaching practices associated with individualising instruction. This view (that it is the structuring that is significant) is supported by the conclusions of a review of reviews on the quality of instruction by Schiller et al (1980) which was undertaken to identify instructional techniques which have proved successful in promoting student achievement, retention and attitudes to learning. PSI and Learning for Mastery (LFM) were two well-defined programmes identified and the authors conclude that, in general, more structured learning settings are associated with higher levels of cognitive attainment.

Student Access

One of the aims of individualising instruction and, in particular, of 'modular instruction', has been to improve student access by removing the constraints of traditional institutional attendance patterns and group instruction. This can be done by presenting courses in self-instructional packages or units, available when needed by the student. The class as an organisational unit may disappear. Instead there can be learning stations where students work through self-instructional materials or an open laboratory or workshop is set up available for use at all hours. Supervision is provided where learning still takes place in an institution.

A description of how to organise and manage a fully individualised instruction programme at the course level within an institution of vocational and technical education is given in Pucel and Knaack (1975). Students agree on a programme in consultation with an instructor and this is entered in the records. CMI is then used to keep track of the students' progress. Instructors are accountable for a specified number of learning stations in specified locations and for the learning of the students occupying those stations. Another account of large scale individualised instruction in three community colleges in the U.S.A. is given by Hess (1977). Students can enrol and complete at times other than the usual quarter or semester calendar breaks. Students follow programmes tailored to objectives they have set and may progress through modules at their own rate given a mastery requirement.

There is little evidence available of the success of such approaches. Programmes have been individualised and modularised extensively in the TAFE system in Victoria but there is no overall evaluation as yet and furthermore the student population is mostly apprentices for whom attendance and course completion are a condition of employment. An evaluation of competency-based programmes in the American college system gives some indication of the problems that can arise with a different student population (Grant et al, 1979). For example, in 1973 a modularised programme was developed at College IV as an open-access unit of the Grand Valley State College in Michigan. Instruction was to be time-free and self-paced and geared particularly to adult students. Without going into all the problems encountered, it is significant that procrastination was a major one and led to further problems of insufficient effective enrolments to maintain the viability of the programme. As the evaluators state free access also means free exit and they concluded that for busy adults self-pacing soon becomes non-pacing. It was not enough to hand students modules: interaction with staff and other students needed to be built into flexible time-free colleges like College IV to an even greater extent than in more conventional programmes. Here, as in other competency programmes that were time-free, the evaluators saw peer support and group cohesion as important in keeping students in a programme.

Costs

An important consideration in choosing teaching strategies and developing curriculum models is the cost. Individualised instruction has often been advocated as cost effective. It is impossible to compare the costs of variants of individualised instruction because such information is not readily available and because costing itself is not a standardised procedure. Different estimates are based on different decisions about what is costed and how, but it is possible to identify some of the major considerations. There are both starting-up and on-going costs. The starting-up costs include the production of resources, the building of new

areas or changing over of former ones, the provision of storage for resources, A-V equipment, carrels, and workshop equipment. On-going costs may include the updating of resources, servicing and maintenance of equipment and its depreciation, non-teaching personnel to assist in the setting up and maintenance of equipment and materials for student use, paper, copying, filing equipment, clerical assistance for student records or computer assistance if CMI is used.

The cost effectiveness argument for individualised instruction programmes is that the greater cost of setting-up materials and other resources will be offset by the more efficient use of these resources once the programme is running. More students will be serviced and final per capita costs will be lower or, if cost per capita remains higher, the quality of the educational service will be greater, i.e. more enrolled students will graduate or those graduating are educated/trained to a higher level. Evidence on this varies. In an evaluation of five vocational programmes (Faust, 1978), it was concluded that the starting-up and on-going costs of the individualised instruction programmes were higher than those of non-individualised programmes. This would appear to be the case with the starting-up costs for competency based college programmes using prepared learning resources (Grant et al, 1979). Creager and Murray (1971) looking at the use of modules state that costs will not be cut and advocate exchanging modules between institutions as a way of keeping costs down. It might be thought that economies of scale are the answer but this is not always so. With PSI, Black and Boud (1977) show that whereas the costs of introducing PSI in a small class as against the cost of the course replaced was zero, costs increased rapidly with large classes. The main factor in this appears to be the cost of tutoring. In Keller's original programmes, of course, the tutors or proctors as they were called, were unpaid students. In the British system this feature of Keller's plan has proved difficult to replicate, hence the increase in costs.

Another attempt at costing of a simple resource (study packs of off-prints from journals or newspaper clippings collected by a lecturer and put in a folder with a work sheet, housed in a library for supplementary use) not only showed the wide range of extra costs to be considered (shelving, folders, overhead cost, staff salaries of the producers and the library assistants) but found that the cost increased with the number of times a pack was used. It was concluded that although each individual pack may not appear to be very expensive nevertheless with a build-up that is not monitored, the provision of self-instructional materials in these formats uses precious resources at a surprising rate (Harris and Kirkhope, 1979). This example indicates the need to consider more than the cost of any resource on its own. Particularly this is the case where audio-visual equipment is used extensively. Such equipment has been calculated to have an average life of ten years so that 10% of inventory value needs to be set aside for replacement costs (not allowing for inflation) as well as funds for maintenance. Machines like loop-projectors or tape-recorders are not foolproof and the more accessible and less supervised their use the greater the need for constant maintenance and replacement. There is also the cost of the associated software and its updating.

Not all the evidence is negative. In a study of individualised slide-tape instruction for training in the maintenance of hydrofoils, Rumsey (1976) found that training time was reduced by 68% which represented a great saving to the company. He estimates the development costs would have been recovered after approximately 50 students were trained. It is noticeable that savings realised through reduced training time is one of the main economic arguments

often given for training programmes in private industry: since trainees are being paid savings can be considerable. In public education any method that reduces time taken to complete a course reduces the cost for the student and indirectly the society. To benefit the institution, it would require more students to be educated in the time made available so that 'productivity' offsets costs.

A related argument is that individualised instruction involves different trainees using equipment at different times so that equipment needs are reduced and therefore presumably costs (Campbell, 1979). This argument can be turned around: continuous use of resources at all training stations can be seen as necessary to control costs (Pucel and Knaack, 1975). This calls for a very flexibly administered programme. As early leavers or drop-outs go, their places are filled by others so that entry into a programme continues year round. Other ways to control costs suggested by Pucel and Knaack is to put resource materials in an instructional materials centre so that they can be cross-referenced to more than one course to avoid costly duplication. Here they are envisaging a system that is quite differently organised from the traditional educational institution and this is an important point. A UNESCO study of the economics in the use of new educational media makes a distinction that applies to most individualised instruction programmes that rely heavily on media. The study distinguishes between those cases where the basis is a given structure which is not called into question and those where the modern media (substitute individualised instruction programmes) form the starting point for the construction of a novel educational system. In the case of the former, what is proposed is an addition to the existing system and 'The cost of the new structure is necessarily higher than that of the old' (UNESCO, 1979).

The Role of the Teacher

As discussed elsewhere, the role of the teacher changes in individualised instruction. Instead of being primarily an imparter of information, the teacher becomes a manager of the classroom, a tutor, a resource. Where modular course structures are introduced the teacher may be a counsellor helping students plan their individualised programmes. The more control over the components of teaching and learning that is given to the student, the more the teacher must relinquish the role of expert and become a facilitator. This will call for changed attitudes and the rewards and satisfactions for the teacher will be different in nature. The teachers may find that they have much heavier demands put on them (Grant et al, 1979) and the adaptation of teachers to these demands is important for the success of any programme. The attitude of the teacher is crucial (Hartley, 1974; Pucel and Knaack, 1975). In one account from the Georgia Department of Trade and Industrial Relations, it is suggested that not only do the teachers have to be committed to individualised instruction, but that it may be that not all teachers can or should attempt to individualise their courses (Fowler and Seymour, 1974). One way to ensure teachers' commitment is to involve them in the construction of materials, or, where materials are purchased, the teachers who are using the materials should be significantly involved in the purchase decisions so a commitment to use them is present (Pucel and Knaack, 1975). In her evaluation of individualised instruction in vocational programmes, Lambrecht (1972) concluded that the enthusiasm of the teacher for a new approach appeared to be directly affected by the role the teacher played in the development of the materials or their purchase for, like students, teachers were 'more satisfied with those situations over

which they had exercised the greatest control in implementation'.

As well as being committed to any programme, the teacher needs to have an understanding of the principles, components and theoretical framework of a given instructional method or system. Without this the teacher cannot respond sensitively to students's needs and cannot modify or adapt materials and strategies to a given situation (Lambrecht, 1972; Hess and Lehman, 1976; Chastain, 1975). This means that the introduction of individualised instruction programmes must be accompanied by in-service training about the programmes and strategies and about new teacher roles. Examples of innovation that have been sabotaged or rather just quietly killed has been chronicled by Goodlad (1974). Where teachers do not understand what is required there is the form but not the substance of curricular change - often because the teachers do not see the difference between what they think they are doing and what they actually do.

CONCLUSIONS

Individualised instruction has often been advocated as a way to improve the quality of education (effectiveness), or cut the costs (efficiency) or improve student access. Some have hoped that a revolution in education is imminent in which all three aims will be achieved at once. Nothing in this review would support such enthusiasm. The results for improving efficiency are less than encouraging. It is unlikely that anything cheaper than a room with a teacher, a chalkboard and a class will emerge from developments in individualised instruction. Furthermore most resource intensive methods, even CAI, do not involve replacing the teacher but are adjuncts. Where there is a commitment to maintaining if not improving the quality of education, individualised instruction will not result in cutting costs. The reduction of costs in many programmes can come from the curtailing of their duration for all students or for some individuals who progress faster. Although reducing programmes, and especially vocational programmes, to the essentials was often associated with the introduction of individualised approaches, the connection is not essential. Streamlining programmes can be done without changing the instructional method. Individualising instruction does allow variable progression rates and continuous enrolment which may reduce costs by graduating more students with the same resources in a given time period. Whether this would offset the costs of starting up the individualised programme is not yet proven in an institutional setting rather than in a private industry setting with paid employees.

It does seem that individualised instruction has a role in providing more flexible course structures and in improving access for students to courses but there are other ways to achieve this. Semesterization, short courses, more liberal exemptions, credit for prior experience, opening colleges on a year round basis as well as expanding external course offerings are other possibilities. Individualising instruction needs to be seen as only one strategy to improve access and one to be used with care. Especially this is so where the groups being assisted are disadvantaged adults with low levels of prior educational attainment. Such groups are least likely to have the learning and self management skills necessary for successful self-study.

Where individualised instruction leads to self-instructional units available at any time or off-campus we are really looking at a variant of distance education. It is significant that while moves have been made to loosen the structure of traditional classroom instruction, distance educators have been

humanizing and diversifying the traditional correspondence course to include greater use of media, group telephone tutorials, residential sessions and so on. The promise of individualised instruction may be in a merging of off-campus and classroom-based programmes that combine the best of their instructional strategies. If such a merging or blending were to come about, the present clear distinctions in most institutions, often enshrined in separate teaching and administrative sections for on-campus and external courses, would need to be dissolved.

As regards the improvement of teaching and learning, from the results presented we can establish that various forms of individualised instruction can produce results as good as traditional teaching. Whether any such approaches lead to meaningfully better performance is not clear except for PSI. Nor is it clear just what is responsible for the improved performance. It may be that it is the introduction of structured learning with an improved quality of teaching, rather than the individualising as such, that is the important innovation. Such a distinction is a fine one but important. It would suggest that we should be looking to improving all instruction, which would inevitably lead to some degree of individualising parts or all of lessons and subjects to meet differing student needs, rather than importing ready-made systems of instruction that may not be appropriate to a particular teaching and learning environment and the special needs and features of a particular course.

This review began by attempting to clarify the nature of individualised instruction. It was seen to encompass a variety of stragtegies, systems and resources. Perhaps now we can conclude that, as a system in contrast to traditional teaching, it will solve some problems but create others. Individualising as a strategy, or rather family of strategies, to improve teaching and learning extends the options available to teachers and students intent on improving the quality of the educational experience.

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Specifications of a Grading System

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ABSTRACT

In considering the specifications of systems used to award grades for student achievement, this paper discusses concepts of assessment and of assessment structure. A two-tier structure of asesssment is outlined. Some examples of grading systems are discussed in detail with reference to the implications of objectives and passing grade distributions. The grading systems used by New Zealand universities vary in terms of the number of passing grades used. This is discussed with reference to the work of Mitchelmore (1981) who has demonstrated the relationship between the reliability of assessment and the uncertainty of grade allocation as a rationale for determining the appropriate number of passing grades. A grading system needs clear specification in terms of the issues discussed in this paper, if the grades allocated to students are to be reliable and valid indicators of student quality.

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INTRODUCTION

In this paper, grading will be considered as a procedure that produces a single grade (or class) to describe a student's achievement at the end of an assessment task, a course or a programme of studies. The implications of producing such a grade will be discussed in terms of the marks from which the grade is derived, and with reference to the structure of assessment in terms of course objectives for teaching and learning. Although Terwilliger (1977) asserts that the terms 'mark' and 'marking system' are synonymous with 'grade' and 'grading system', the following definitions will be used to distinguish their use and interpretation.

A mark is a number assigned to a student to provide a quantitative description of performance on a particular test (Ebel, 1972) or assessment task, e.g. 28 out of 40, 7 out of 10. Marks are often reported as percentages, e.g. 70%. Note that some meaning is then lost with reference to the unit score in the context of the total attainable score, e.g. the difference between 7/10 and 28/40 in terms of weighting and number of marks 'lost' (3 or 12). The total range of marks to be allocated in the process of marking a component or assessment, can have an effect on mark spread or standard deviation which affects the actual weighting (Fowles, 1974).

A (final) grade is usually interpreted qualitatively as a description of student performance or ability. It is allocated on the basis of a single mark (often representing a combination of marks). Grading is the process by which marks are translated and combined into a reporting scheme of (usually) 7±2 discrete elements (cf Miller, 1956). Grade decisions are among the most important which a teacher has to make in higher education (Heywood, 1977).

In 1963 Glaser indicated to teachers that, in assessing achievement, they could be looking for two distinct kinds of information:

(i) whether the student had achieved a particular level of knowledge or a specified degree of competency in the performance of a skill;
or
(ii) the relative ordering of the student in respect to the student's peers.

Or, as Ebel (1965) put it, the quantity of a student's achievement can be expressed in either or both of two ways:

(a) as the proportion learned of what the student could or should have learned, or
(b) as the proportion of the class (or peer group) who learned less than the student did.

To the first kind of measurement, using a content or 'absolute' framework, Glaser (1963) gave the name 'criterion referenced measurement' (CRM). The second kind of measurement, using a 'normative' framework, he called 'norm referenced measurement' (NRM). With most assessment systems these two modes (or categories) of assessment are combined in an arbitrary fashion within a single assessment component or when different components are combined to give a total or composite mark. Therefore, marks are the common currency of assessment and are used for definition of performance (criterion-referenced), for description or performance with reference to other students (norm-referenced), and for translation and combination into a composite mark or grade. Terwilliger (1977) adds 'self-referenced' in suggesting three

philosophical points of view which are discussed briefly.

(a) The Behaviourist or criterion referenced point of view: once students have attained the criterion there are no differences among them so the assignment of grades reflecting individual differences is meaningless. For mastery (although purists dispute the concept of a level of mastery) it is common for the criterion to be expressed as a percent of the maximum attainable (or perfect) score, e.g. 80%.

(b) The Humanist or self-referenced point of view: value judgements are concerned about attitudes and self-concepts as well as about knowledge and skill; these judgements are individualised about the performance of each student with reference to individual change and/or aptitude. Self-change is the criterion and the performance of others are irrelevant. In a changing society, traditional examination competence is no longer seen as synonymous with academic competence, and the change in student philosophy is toward self-knowledge and self-expression (Cox, 1973). Boud (1979) also argues that there is much justification for moving away from an assessment system based entirely on the assessment of students by teachers, and notes growing interest in collaborative self and peer assessment as alternatives to unilateral assessment.

(c) The Pragmatist or norm referenced point of view: education is both a preparation for life (work/employment) and an opportunity to develop those talents and abilities which are unique to each student. The pragmatist is primarily concerned with practical choices and consequences of such choices. Because both the choices and their consequences are dependent on individual differences and skills (and their potential for development), differentiation among individuals is functional and grading is appropriate.

Grading systems are usually specified using numbers or letters to represent ranges of marks on a percentage scale. At the extremes, the percentage scale can be considered as a 100-point grading system whereas a pass/fail (P/F) system is in terms of two grades only. Grading systems that incorporate more than one passing grade are used to report different levels of performance for discrimination purposes, e.g. for the award of scholarships, for selection by employers or for entry to higher levels of education or training. Grades are thus used as indicators of ability and predictors of future performance. Grades are, however, only as reliable as the marks from which they are derived; in turn these marks represent samples only of certain student qualities which are determined by the form as well as the content of assessment. As will be discussed in this paper, grading systems can overcome the unreliability and uncertainty associated with any final mark which represents student performance. A grading system may also incorporate provision for allocating particular grades to a pre-determined proportion of the class or peer group of students, as will be seen in the next section.

GRADING — PROCEED WITH CAUTION

Some examples of grading systems are discussed so that their specifications can be compared and contrasted. The examples are taken mainly from Australia and New Zealand with some reference to a grading system used in the U.S.A.

The following extensive extract from a 'Guide to Examiners' (University of Queensland, 1973) gives details of a grading system and related procedures.

The grading system provides for two types of criteria: 'objectives achieved' and 'academic standard' (of performance). A seven-point numerical scale is proposed in place of a six-point letter scale. This grading scheme is selected to provide an example of the combination of a criterion referenced with a norm referenced technique (Terwilliger, 1977).

If evaluations in terms of marks on a scale are to lead to reliable grades, which can be used on an inter-departmental basis for purposes such as the award of scholarships, they need to summarize evaluations accurately and to be as 'absolute' as possible.

If grades are to summarize evaluations accurately, it is important:

(a) to have clearly defined, realistic objectives for the course, and to be able to rank these objectives in order of significance;
(b) to structure the learning experience in such a way that students will have an opportunity to achieve these objectives;
(c) to evaluate in terms of these objectives.

Obviously, objectives will vary from department to department, and they may also vary from lecturer to lecturer, and from year to year, within the one department. It is not suggested that there should be a common list of objectives, but that the grades should have their roots in the careful evaluations of some objectives. It might be claimed that the objectives of Department X are 'better', 'more demanding', or 'more scholarly' than those of Department Y and, accordingly, that higher grades should be given for the mastery of Department X's objectives than for mastery of Department Y's. However, a case of this kind would be difficult to sustain, and one has to assume that the objectives of different departments are equal in value. If this assumption is made, it becomes possible to achieve some measure of comparability by asking staff members to grade according to the level of mastery that their students display. Thus:-

7(HD)	All major and minor objectives achieved.
6 (D)	All major objectives achieved, some minor ones not.
5 (C)	All major objectives achieved, many minor ones not.
4 (P)	Most of the major objectives achieved, most of the minor ones not.
3(Pc)	Some of the major objectives achieved, none of the minor ones achieved.
2 (N)	Only a few of the major or minor objectives achieved.
1 (N)	None of the major or minor objectives achieved.

If the procedure suggested in these notes is adopted, the same grade will represent the same degree of mastery in Department X as in Department Y, although what was being mastered would be unknown and likely to differ markedly.

Thus, in summary: it is recommended that, in their grading of students, staff members should:-

(1) Begin by carefully identifying the objectives of the course, and by grouping these objectives as 'major' or 'minor';
(2) ensure that they evaluate in terms of these objectives;
(3) grade their students according to the levels of mastery achieved;

(4) keeping in mind the percentages of students that might be expected to achieve different levels of mastery, although there would be instances when a departure from these percentages would be justified.

Table 1: Grade Equivalences

Proposed grade	Present grade	Approximate percentage	Academic standard
7	HD	85 - 100	Outstanding performance
6	D	75 - 84	Very good performance
5	C	65 - 74	Above average performance
4	P	50 - 64	Satisfactory average pass
3	Pc or P-	Just below 50	Slightly below average
2	N	-	Well below pass level
1	N	-	Bad failure

Note: The percentages and equivalences given are not to be considered mandatory but as being for guidance only.
Source: Guide to Examiners (University of Queensland, 1973).

In the above extract, recommendations 1-3 are criterion referenced while 4 'keeps in mind' a norm referenced suggestion. Foster (1976) sees this as inconsistent, particularly if the outcome is an allocation of fixed percentage rates for each grade, thus fixing an overall pass/fail rate. He describes such a grading scheme as 'a nebulous entity composed partly of university regulations, partly of recommendations handed down by boards and committees, and partly of convention and consensus'. In other words, it represents current acceptance of a representation of accumulated experience of assessment and grading in the institution. It is essentially a pragmatic approach which allows for modification and flexibility in guidelines based on experience with an inclusive reference group consisting of all students who have received comparable instruction (Terwilliger, 1977). In 1978, the 'Guide to Examiners' incorporated guidelines for (normal) proportions of students expected to achieve passing grades (University of Queensland, 1978). As shown, these guidelines attempt to meet Foster's criticism by assigning a range to each grade with provision for a total pass rate (grades 3-7) of 80-100%:

7: 4-6; 6: 9-11%; 5: 27-33%; 4: 36-44%; 3: 4-6%

In addition, the 1978 Guide makes the point that 'divergencies from the above ranges will occur and should occur, and there will be excellent reasons for them'. But, since the only aspect of the grading process that is observable to the University as a whole is the percentage of students awarded various grades, departments are required to justify departures from the guidelines for passing grades.

Lewis (1972) suggests that:

> by setting statistical limits in failure rates and distinction rates, we sacrifice educational considerations in the interests of expediency. At the same time we help to perpetuate the lie that all courses are very much the same when, in reality, some might be very good and others might be atrocious. (p.116)

Hohne (1955) also makes the point that university examiners preferred to pass and fail almost identical proportions of students year after year rather than ascertain the true calibre of the students and adjust their fail rates accordingly. Norm referencing, and the allocation of student percentages to grades, raises what Hodgkinson et al (1975) consider to be a universal problem with standards; i.e., 'the inability to specify the reference group with which the person's performance is being compared.'

Terwilliger (1977) sees the use of the more inclusive norm group (across one year or over a period of years) as reducing emphasis on the performance of one class only, thereby reducing competitiveness. However, he is of the opinion that the only realistic method of grading is to specify in advance the approximate distribution of grades that is desired for the entire norm group, e.g. A = 15%; B = 25%; C = 40%; D = 15%; F = 5%.

As with the University of Queensland example, the grade distribution for a particular class group may deviate substantially from the specified distribution. An example from the USA is that of Michigan State University (Dressel, 1961): A: 0-15%; B: 20-30%; C: 40-50%; D: 10-20%; E: 0-10%. Ebel (1972) suggests seven levels of average academic ability for classes which might therefore merit different distributions of marks for the allocation of grades. They are: (7) Exceptional; (6) Superior; (5) Good; (4) Fair; (3) Average; (2) Weak; (1) Poor. It is of interest to compare these descriptions with the range of academic standards described in Table 1.

Table 2 shows the passing grades used in New Zealand universities, together with brief information for the various interpretations of the different grades. In these systems, the allocation of passing grades depends on mark ranges or broad bands. In a recent report on the reliability of marking of GCE (UK) examinations, Murphy (1982) approved of the warning from the Schools Council to users of GCE and other public examinations that '.... research has suggested results on a six or seven-point grading scale are accurate to about one grade either side of that awarded' (Schools Council, 1980).

In 1961, the University of New Zealand had a single grading system. With devolution, the separate universities have adopted different passing grade systems (Table 2) which range from four to nine grades. The Victoria University of Wellington (VUW) system is markedly different from the others and corresponds to the traditional (UK) Honours degree classification system of a First (1), Second Upper (2.1), Second Lower (2.2) and a Third (or pass).

All the examples described are grading systems associated with the internal assessment procedures conducted by universities. A final example, from New Zealand, is the grading system used by the Authority for Advanced Vocational Awards (AAVA) as the national examining body for certificate courses taught in technical institutes and community colleges. The Authority recommends A = 75-100; B = 60-74%; C = 50-59%; D = 45-49%; E = 0-44%. The correspondence of this system with that of VUW is clear; the conflation of B1 and B2 grades is supported by Heywood (1971) with reference to the implications of the standard error of marking which will be discussed later.

Table 2: Passing grades used in New Zealand Universities (1982)

Auckland	Waikato	Massey	Victoria	Canterbury	Lincoln	Otago
A+ high first	A++ 90-100	A+)		A+	A+ (Examiner's discretion)	A+
	A+ 85-89	) First Class				
A clear first	A 80-84	A) Pass	A 75-100	A	A 70-76	A
A- bare first	A- 75-79	A-)				A-
B+ high second	B+ 70-74	B+)	B1 68-74	B+	B+ 65-69	B+
B clear second	B 65-69	) Second B) Class				B
B- bare second	B- 60-64	) Pass B-)	B2 60-67	B	B 60-64	B-
C+ sound pass	C+ 55-59	C+)		C+	C+ 55-59	C+
C pass	C 50-54	) Pass C)	C 50-59	C	C 50-54	C
C- marginal pass				C-	C- 47-49	C-

ASSESSMENT STRUCTURE

In general such grading systems have two principal characteristics: various categories of passing grades are specified, and the pass/fail boundary is usually specified as 50%. These specifications are now discussed in terms of assessment structure and mark interpretation.

In the introduction, reference was made to two distinct kinds of information (Glaser, 1963) which teachers could consider when assessing achievement, viz. criterion referenced and norm referenced. For a grading system this is recommended by Terwilliger (1977) in the following form:

> For any multi-category grading system, a two-stage grading procedure which employs both criterion and norm referenced methods is superior to either method alone. At the first stage, acceptable performances are distinguished from unacceptable performances using 'minimal objectives' with a specified criterion. At the second stage, students who have achieved the minimal objectives are differentiated using more advanced objectives and norms based upon previous students in the same course. (p.39)

Nisbet (1971) recommended more use of criterion referenced assessment in preference to norm referenced assessment and suggested that there should be two different types of assessment. This concept of two types or modes of assessment can be identified from other sources as summarized in Table 3. The taxonomic structure of educational objectives (Bloom, 1956) has been divided into two 'tiers' referred to by Imrie et al. (1980) as Tier I (basic abilities) - recall/application, and Tier II (higher abilities)- problem solving (which includes essay writing). Table 3 also shows the correspondence of the two-tier concept to the two basic cognitive modes of Getzels and Jackson (1962), and to the 'minimum essentials' and 'developmental level' of Gronlund (1970). Gronlund's approach assumes that effective teaching and assessment require a clear conception of the desired learning outcomes.

> Learning outcomes that are considered minimum essentials are typically low-level outcomes that can be rather easily achieved by students and that serve as prerequisites to further learning in the area. Those outcomes at the <u>developmental level</u> represent goals toward which students may show degrees of progress but which they can never fully achieve. (p.41)

There is thus a conceptual consensus for such a two-tier structure which provides for appropriate interpretation of a minimum pass level (50%) and of related categories of passing grades.

Table 3: Modes for the two-tier structure of assessment

TIER II	EVALUATION SYNTHESIS ANALYSIS	Higher abilities PROBLEM SOLVING	'Revising the known, exploring the undetermined, constructing what might be.'	Developmental level 'Goals towards which students may show progress.'
TIER I	APPLICATION COMPREHENSION KNOWLEDGE	Basic abilities RECALL/APPLICATION	'Retaining the known, learning the pre-determined, conserving what is.'	Minimum essentials Low-level outcomes/ prerequisites
	(Bloom et al., 1956)	(Imrie et al., 1980)	(Getzels and Jackson, 1962)	(Gronlund, 1978)

MARK INTERPRETATION

In determining the specifications of a grading system, it is necessary to retain an appreciation of derivation and dependency. Grades derive from marks which depend on student responses to the questions of assessment. Or, as Isaacs (1974) puts it, 'the essential prerequisite for meaningful grades is meaningful marks'. When discussing the meaning of marks, Travers and Gronlund (1950) risked stating the obvious in commenting that uniformity of use of a marking (or grading) system depends on 'the extent to which the system has been carefully defined and the degree to which staff are familiar with the definition'.

Definition of a grading system can start logically with the identification of 50% (say) as the pass/fail boundary. It is reasonably obvious that within one institution or educational system, the pass level mark for every examination in each course or subject, cannot be exactly 50% without some mark adjustment to compensate for well-known examination deficiencies such as setting/marker reliability, sampling, time dependency, etc. Also, assuming the same average quality of students and the same course objectives etc., the examination paper for a course one year may be more easy or more difficult than in the previous year. Since 50% is a 'fixed point' for the grading system it follows that sets of marks need to be adjusted according to certain specifications.

These specifications relate to three principal characteristics of a set of marks for a group or class of students: the number of marks (students), the mean, and the standard deviation. In addition, the (final) set of marks to be used for grade allocation is usually the outcome of combining sets of marks from assessment components such as assignments, practical work or the questions of an examination paper. When sets of marks are combined to form a total or composite set of marks, another parameter becomes significant - the correlation of each component set with the total. The distribution or ranking of the final set of marks is dependent on the standard deviation and correlation for each set, and their product determines the actual weighting of the component. This weighting is imposed by these factors and is generally

different from the predetermined or planned weighting, with obvious implications for grading (Fowles, 1974).

Consider the general case of one set of marks for in-course assessment (coursework) being combined with a set of examination marks (end-course assessment). The two sets represent different measurements of different student qualities. For an external examination system such as that of the AAVA the specified proportions for combining coursework and examination are 40% and 60% respectively. For an internal examination system (e.g. VUW) the proportion of the final Registry-controlled examination can be zero (100% in-course assessment) or not less than 40%. The same principles apply.

When proportions or weightings are specified three principal interpretations can be considered:

(a) An assessment component allocated 40% (say) means no more than it will be marked out of 40 or, if a different mark range is used, the appropriate proportion will be calculated.

(b) A component allocated 40% means that it should contribute 40%, on average, of the marks awarded for all the grading requirements. This interpretation considers the question of difference of difficulty (Thyne, 1974) with reference to the average or mean mark for all students (regardless of individual ranking).

(c) A component allocated 40% means that it should contribute 40% in effect to the final ordering or ranking of students. This interpretation requires consideration of standard deviation and correlation to determine the difference between the actual and the specified weights when sets of marks are combined for grading purposes.

Accepting the first interpretation to signify proportion whether the assessment component is marked out of 40 or 100, the marks are still student-specific regardless of how many (or how few) students are in the class or group. For a group of students, however, the means of coursework marks (C) and of examination marks (E) need to be related to the fixed pass mark (50%) and to each other (40:60). For example, adjusted means for coursework and for examination (and therefore for the total or composite set of marks) might be specified as 60% (therefore, $0.4 \times 60 + 0.6 \times 60 = 60\%$). This is the significance of the second interpretation.

The third interpretation of weight is with reference to ranking and considers the specification of standard deviation (or spread) for allocation of grades; the adjustment for the correlation effect to be carried out as a final stage of mark interpretation. Continuing with the AAVA example, the rank position of students in the final set of marks is determined by the relative standard deviation of the component sets of marks. (If all students had the same coursework mark the standard deviation would be zero and make no contribution to rank position which would then be determined by the examination rank only). Therefore, the adjusted standard deviations are specified in the ratio 40:60. For two perfectly correlated sets of marks with a standard deviation of 12 (say), on a percent scale, then the standard deviation (S_T) of the combined set would be $0.4 \times 12 + 0.6 \times 12 = S_C + S_E = 12$. In practice, the correlations would be less than one and the total standard deviation would be $S_T = 0.4r_C12 + 0.6r_E12$, where r is the correlation of the component with the total. Since r_C and r_E are usually less than one, S_T is usually less than S_C plus S_E. As well as the ratio of standard deviations for coursework (S_C) and for examination (S_E), their respective magnitudes should also be specified. For the mark ranges of 40 and 60 being discussed, standard deviations of 4 and 6 would be typical and appropriate or even 4.8 and 7.2 as in the example above, depending

on the significance of the correlation effect.

A principal characteristic not yet discussed is N, the number of marks or students. If N is small (say less than 10) the statistical significance of the above considerations has little validity for mark interpretation. It is conceivable, for example, that a small class of diligent, motivated, able students at an advanced level of study will all score high marks and all merit A grades. In this case and in general, the level of ability of the class could be specified in terms of the extended norm-reference of experience of different classes. The seven point scale (Ebel, 1972) discussed earlier in the paper, can be simplified and associated with different mean levels for mark adjustment:

Below average (55%); Average (60%); Above average (65%); Well above average (70%)

How many grades should be used to report student achievement in terms of the above specifications? Mitchelmore (1981) suggests an answer to this question with reference to the differences in types of assessment used to produce marks. Mitchelmore proposed the following criterion: a grading scale is acceptable in a given assessment situation if the average probability of a student being regraded within one scale point of the original grade on a parallel assessment is at least 90%.

When a student sits an exam or hands in an assignment, the subsequent mark represents a sample, only, of student qualities in the context of a course of study. It is uncertain that the mark is an exact measure (also because of time dependency, marker reliability, etc.). This uncertainty is referred to as standard error (SE) which is the standard deviation of the set of marks that a student would obtain on all imaginable parallel assessments (with a mean equal to the student's true score). Mitchelmore investigated the application of the proposed criterion: the results are summarized in Table 4.

Table 4: Estimated SE's and maximum acceptable* numbers of grades for selected multiple-choice and essay tests

Test Type	Test Length	Estimated SE (Out of 100)	Maximum acceptable number of grades
Multiple-choice	20 items	1.9 (9.5)	5
	50 items	3.1 (6.2)	7
	100 items	4.3 (4.3)	9
Essay with fairly objective scoring	1½ hr/ 50 marks	7 (14)	4
	3 hr/100 marks	10 (10)	5
Essay with highly subjective scoring	1½ hr/ 50 marks	11 (22)	3
	3 hr/100 marks	16 (16)	4

*According to the criterion stated, assuming a pass mark of 40 per cent, a distinction mark of 85 per cent, and approximately equal grade intervals between these two scores.

In practice, as noted, the final grade is usally determined from a composite mark; Mitchelmore suggests that a six-point scale would be appropriate for the combination of five short multiple-choice tests and a final essay examination. In such cases, the marks or scores for each component (suitably weighted) should be recorded, with grades used only for the total assessment mark. Imrie (1981) discusses the need to confirm weighting intentions with reference to standard deviations and correlations when sets of marks are combined.

CONCLUDING COMMENTS

Some grading systems have been described. Justification of a system and its use for the allocation of grades, depends on appropriate specifications with reference to mark interpretation and assessment structure. Usually the grading system has been established as institutional policy in terms of the number of grades and their correspondence to marks on a percent scale. Accordingly, the planning of assessment procedures should take into account the type of assessment appropriate to learning outcomes and to the implications of measurement uncertainty. The two-tier structure of assessment provides for discrimination between criterion-referenced and norm-referenced measurements within a single assessment component or for the whole course or subject. The teacher or examiner should specify the intended weightings, means, standard deviations and correlations for the principal assessment components contributing to a final grade. These intended values can then be compared with the actual values for evaluation of the assessment and for mark interpretation.

Further specifications of the grading system are required for mark adjustment so that the grade boundaries (including the pass/fail boundary of 50%) can be applied consistently across institutions, disciplines, levels and over a period of years. The specifications for large classes include the mean (consistent with an estimate of the quality of the group) and the standard deviation for principal components of assessment such as coursework and the final examination. Computerised grading packages are available to assist with the adjustment and interpretation procedures required so that appropriate professional judgement can be used for the allocation of grades.

According to the criterion of Mitchelmore (1981) it would seem that the Victoria University of Wellington and the Authority for Advanced Vocational Awards grading systems are well able to cope with the wide range of methods (and therefore of SE's) used for in-course and end-course assessment. It is, however, necessary for a grading system to be represented qualitatively and interpreted consistently. The marks awarded for different assessment components at different times during a course and then combined at the end of the course, should represent standards of attainment understood clearly by staff and students alike. Careful definition and awareness will assist greatly with the professional responsibilities for maintaining standards.

Guidelines cited earlier suggest that there should be similar grade distributions from subject to subject 'except where special factors exist'. One such factor not mentioned has been clearly identified from work on student evaluation of courses (Clift and Imrie, 1981). In some courses, students respond that they 'want to do as well as possible' and identify (realistically) the grade associated with that intention. In other courses, high proportions of the course enrolment indicate an intention 'just to pass'. On this basis, it is not possible to expect similar grade distributions and therefore not reasonable to impose invalid uniformity. In general there is no academic or

educational justification for a fixed pass/fail ratio; a quota might, of course, be used for administration purposes.

Any grading system should be fair and consistent. The principles and procedures of a grading system should be stated clearly so that the responsibilities of staff and the rights of students are identified. It is the professional responsibility of staff to be competent in all of the assessment procedures required for the allocation of grades; it is the right of students to know the specifications of any grading system which labels them permanently.

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Anatomy of an Unsuccessful Innovation

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ABSTRACT
This article reports on an unsuccessful innovation in interdisciplinary studies. Despite detailed planning, patient negotiations both within and outside the committee structure, and lobbying of decision-makers, the goal of introducing interdisciplinary subjects [1] in Energy Studies at Caulfield (now Chisholm) Institute of Technology was not achieved. Innovation strategies followed in the Energy Studies project are examined in detail and attention is focused on organisational constraints which impeded the implementation of Energy Studies. The underlying message is that a great deal of time and effort can be saved if a realistic assessment of constraints is made before an innovation is attempted. Based on the experience of Energy Studies, suggestions are made for surmounting constraints in a highly departmentalised system.

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INTRODUCTION

An interdisciplinary course or subject is one that attempts to integrate and utilise the findings and principles of more than one academic discipline. This approach contrasts with multi-disciplinary studies in which disciplines are juxtaposed, but the relation between them is not made explicit in teaching (CERI, 1975, p. 25). Interdisciplinary studies should be seen as an extensive range of possibilities covering combinations of disciplines where links are not well-developed, subjects or courses where there is increasingly evident integration, and fully integrated interdisciplinary courses (Group for Research and Innovation in Higher Education, 1975a).

It is difficult to sustain a case for interdisciplinary studies without reference to specific proposals. Experience in colleges of advanced education (CAE) and universities demonstrates that a great many constraints must be overcome if an interdisciplinary approach is to work satisfactorily. Course or subject proposals must therefore be examined closely to determine whether adequate attention has been given to anticipating potential problems. Aspects of particular importance are the adequacy of the planning process and the availability of resources. Perhaps the unique advantage of interdisciplinary studies is that they actively promote a cross-fertilisation of ideas which is generally absent in a single discipline or multi-disciplinary approach. An issue such as world energy needs may be examined from the point of view of a single discipline, e.g. Sociology or Electrical Engineering, but separate disciplines do not provide the basis for coming to grips with a full range of issues. On the other hand, an interdisciplinary study of energy needs may involve an examination of the full range of sociological, political, engineering and economic factors. It is likely that participants who are otherwise involved in a single discipline will develop greater sympathy with other disciplines as a result of this approach. Once a strong commitment to interdisciplinary studies emerges, a discipline-based approach may be less fulfilling and challenging to the lecturers concerned.

STRATEGIES FOR THE INTRODUCTION OF ENERGY STUDIES

Course development involves a series of administrative decisions which provide a framework for a study of formal and informal processes. These processes are highly complex and may involve negotiations within an organisation (such as a CAE) and with external bodies. In examining Energy Studies at CIT the focus is on internal negotiations directed to securing resources and providing an organisational base. External negotiations were not involved as the subjects were to be electives in existing courses and therefore did not require the approval of the state co-ordinating authority.

The Process of Innovation

Innovation involves changes which are deliberately planned and adopted. The innovation may not be new in the absolute sense, but it is perceived as new by members of the community into which it is introduced (Collier, 1974). A framework for the analysis of the decisions made in curriculum planning has been suggested by Delbecq (1974). The initial phase in innovation entails

obtaining a mandate for the development of the course. Following initial approval, the central issues surrounding the course are identified and strategies are developed to deal with problems. During these phases of the innovation process, the course planners are striving to establish the legitimacy of their innovation and if initial strategies are poorly conceived the proposal may fail.

It is often difficult to innovate in established tertiary institutions. The innovator must contend with 'networks of closely interlocking procedures, policies and mutual expectations based on past experiences'. (Group for Research and Innovation in Higher Education, 1975b, p. 33). As a result, innovation may not be an orderly or continuous process (MacDonald and Walker, 1976; Shaw, 1975; Wellard, 1980). There may be considerable delays in making decisions, a need for intense lobbying and lengthy informal discussions outside the committee system (Noble, 1982). All of these features were present in the development of the Energy Studies project.

Energy Studies evolved in response to a growing interest in interdisciplinary studies within the Institute. In 1978 a working party on interdisciplinary studies was set up by the Board of Studies, the Institute's senior academic board. It recommended the establishment of one or more centres for interdisciplinary studies and suggested that, in undergraduate courses, at least one elective subject should be chosen from a range of interdisciplinary subjects. The report was not acted on by the Board of Studies during 1978 and at the time the future of interdisciplinary studies seemed to rest on initiatives by existing departments and schools.

Despite a lack of enthusiasm in the Board of Studies an informal working party on interdisciplinary Energy Studies was established in late 1978. The efforts of the working party to obtain a mandate for Energy Studies were encouraged by the appointment of a new Director who was keen to foster interdisciplinary initiatives. A major break-through occurred in 1979 when the working party obtained an Institute grant of $20,000.

Energy issues were selected as a focus for interdisciplinary studies largely because of the interest of some staff in this area. Existing courses and subjects gave inadequate attention to energy trends and problems, despite a world-wide concern with whether energy needs could be met in the long term. Members of the working party were drawn from the Schools of Business, Applied Science, Engineering and General Studies, and from the Educational Development Unit. Because the members comprised a good cross-section of the Institute it was considered likely that Energy Studies electives would be offered in most undergraduate courses.

The key members of the working party were the chairman, a lecturer in Engineering, and the secretary, a tutor in Economics. Throughout the project the working party relied heavily on the enthusiasm and organising ability of these members. Unfortunately, neither the chairman nor the secretary was tenured, a fact which proved significant later in the life of the project. As a member of the working party my role was to advise on appropriate strategies to be followed in piloting the electives through the committee system (2). A full-time research officer was appointed to co-ordinate the project and his knowledge of energy trends and problems was invaluable.

Negotiations

Innovators may use negotiations to surmount constraints or minimise their impact. This strategy may involve compromises on course content and structure to secure the approval of submissions. In his study of curriculum change in a college of education, Shaw concluded that a successful innovation must be reasonably acceptable to the group interests (for example, other departments) on which it impinges. It is a largely public process in which the best result is a solution where all get most of what they want, rather than a reluctant compromise (Shaw, 1975).

The development of Energy Studies involved protracted formal and informal negotiations in which the working party attempted to establish its legitimacy. Research papers were commissioned for publication with the aim of providing a resource for elective subjects and short courses. The papers were written by members of the working party and external consultants on topics such as world energy resources, the renewal of Melbourne's public transport system, and developing energy strategies for Australia. This activity was peripheral to the central goal of having Energy Studies incorporated in the Institute's courses. A major aspect was the preparation of submissions for consideration by committees. By the end of 1979, the Board of Studies had approved the concept of introducing energy studies electives, providing a basis for developing detailed syllabuses. The next step was to gain the approval of each School in which the electives would be taught and the final endorsement of the Board of Studies. The working party considered that five of the Institute's six schools would be likely to accept Energy Studies, the exception being the School of Art and Design which had shown no interest in the project.

In its anxiety to establish legitimacy the working party probably miscalculated in seeking preliminary approval of its proposals. There was no formal requirement that new subjects should be approved in principle prior to final submission. By imposing an unnecessary step, the working party left itself with insufficient time to achieve the introduction of the electives in 1980. As a result, much of the momentum of the innovation was lost. The working party faced the prospect of a further twelve months of planning and deliberation without being able to point to substantial concrete achievements.

During first semester 1980, the working party made submissions to Schools Boards. Members of the working party took responsibility for piloting the submission through their own School. Where necessary Schools were asked to amend their regulations to facilitate the introduction of Energy Studies electives. Informal negotiations took place with potential opponents and individuals perceived as powerful. The negotiation process was successful and in July 1980 the electives were approved by the Board of Studies. Unfortunately, this did not guarantee implementation as it was necessary to secure funds for the project.

There was considerable organisational support available to the development of Energy Studies. The Institute's Director gave every encouragement to the working party and personally launched the publication of Energy Studies Papers. Assistance in planning and administrative support was provided by the Educational Development Unit. The original working party was replaced by the Energy Studies Co-ordinating Committee which reported direct to the Board of Studies. This change was initiated by the working party to strengthen the organisational base of the project. Staff commitment remained strong and eight members of staff were involved over the years 1979 and 1980.

CONSTRAINTS AND PROBLEMS

Despite the persistence of the innovators, the Energy Studies project failed to achieve its major goal, the implementation of elective subjects. The main reasons for this failure were organisational constraints which proved insurmountable. As has been shown, the Energy Studies electives passed successfully through the various stages imposed by the Institute for the approval of new subjects. Unfortunately, the organisational structure of schools and departments was a much more powerful constraint than had been anticipated by the working party.

The concept organisational readiness is a convenient means of analysing organisational constraints. In course development the readiness of a CAE to initiate a course relates to both problem awareness and solution awareness. Problem awareness is influenced by environmental and organisational conditions. Where the environment or technology is changing rapidly CAEs are likely to be prone to innovate. Solution awareness is the degree of technical or conceptual originality in the proposed course and the existence of precedents operating elsewhere. Organisational readiness is enhanced to the extent that a course proposal is compatible with existing programs (Delbecq, 1974). On reflection, some of these requirements were not present at CIT.

By 1979 when the Energy Studies project was being planned, funds to tertiary education were severely restricted. At CIT funding arrangements in the period studied were geared to the needs of departments and schools. Interdisciplinary teaching was given a low priority and departments were reluctant to release staff unless departmental budgets were compensated. It soon became clear that teaching in Energy Studies would be a voluntary activity for interested members of staff. Although several lecturers were prepared to donate their time to teaching Energy Studies, this did not extend to the co-ordination of the project.

The existence of departments was a major constraint in other ways. Departmentalism has been described by one writer as 'the besetting sin of the academic profession' (Perkin, 1974, p. 145). Academics invest in developing a personal specialisation and see encroachments by other specialists as a threat to 'property' (Burgess, 1977, p. 99). This lack of organisational readiness is especially evident in interdisciplinary studies as 'departments typically do not throw their influence on interdisciplinary work' (Mayhew and Ford, 1971, p. 107). The experience of Energy Studies confirms these findings. An alternative approach might have been to establish a new department, but in a climate of fiscal restraint this option was closed.

A Nuffield Foundation Group for Research and Innovation in Higher Education (1975a) observed that 'Interdisciplinary work often involves a professional risk for those who embark on it' (p. 23). If a lecturer becomes heavily committed to interdisciplinary studies, there is a possibility that he or she will forego opportunities for advancement which may be available to colleagues who remain firmly discipline-based. A related problem at CIT was that three key innovators, the chairman, secretary and research officer, held contract appointments. Two positions were not renewed when the contracts expired and the third person obtained a position elsewhere. As a result, the project was deprived of drive and enthusiasm at a crucial time in its development. This further undermined the readiness of CIT to implement Energy Studies.

LEARNING FROM EXPERIENCE

By the end of 1981 the Energy Studies Co-ordinating Committee had lapsed and the elective subjects were not offered in 1982 or 1983. Nevertheless, the failure of the Energy Studies project should not be overstated as a number of benefits flowed from the original investment of funds and staff time. The research officer assembled a substantial resource bank of audio visual and print materials which have been used by students in Economics, Politics and Engineering. Some existing subjects were adapted to include segments on Energy. The Energy Studies Papers provide original articles dealing with contemporary energy problems. There are continuing initiatives in Energy Studies at Chisholm. A member of the original working party has developed Energy Studies subjects which will be incorporated in degree courses in Engineering. He is using the resources of his department to undertake and encourage research in areas such as energy conservation and energy in transport. It is planned to offer short courses, including an energy education program for teachers. These initiatives build on the initial spade work of the Energy Studies project and will ensure that Chisholm is prominent in the energy field.

An innovation may be justified not only for its specific achievements, but for the insights it provides into organisational responses to change. The Energy Studies project tested commitment to interdisciplinary teaching. It attempted to alter the internal boundaries of the system in which it operated by integrating disciplines, challenging funding arrangements and cutting across departmental structures. The experience of Energy Studies is relevant to innovators working within a highly departmentalised system. A strategy which may be successful is to find a base in a suitable academic department. This entails obtaining the agreement of the head of department to support the project in the initial stages and to give an allowance of time to the co-ordinator. There is the risk that the project will be identified with a particular department but the advantage is that it becomes part of the existing academic structure. The project is therefore more likely to gain access to resources.

Location within an existing department may be a means of fostering the project to a stage of development at which it could become independent. The innovators must continue to work towards achieving organisational support outside the department, including efforts to secure additional resources. These arrangements must be understood and accepted by the head of department in which the project is based. In the long-term the organisational structure adopted is likely to depend on the complexity of the project. For example, if research funds are attracted, several subjects are offered, or a course is planned, it may be desirable to establish a more permanent structure. This could take the form of a new department or centre for interdisciplinary studies.

There is a need for career structures to recognise the importance of contributions to interdisciplinary studies. Contract staff who become involved in an interdisciplinary project may do little to enhance their career prospects. The project team seems to have no choice but to select as co-ordinators or leaders members of staff with tenured positions. To do otherwise may threaten the viability of the project at a crucial phase in its development, as happened with Energy Studies.

The role of committees in innovation must be queried. As the Group for Research and Innovation in Higher Education (1975b) concluded, 'What is certain is that new schemes rarely arise from the careful deliberations of committees, and less often than one might expect from convincing demonstrations of a systematically-researched need' (p. 30). With hindsight, the establishment of the Energy Studies Co-ordinating Committee did little to surmount the constraints facing the project. In the early stages of a project, innovators are better advised to work in ad hoc groups as far as possible and to rely on the drive and enthusiasm of individuals to achieve results. Once an innovation becomes established, a more formal structure may be developed.

OVERVIEW

The development of interdisciplinary studies is likely to be a slow process, especially in the current financial climate. Existing departments are much more defensive of their territory than a period of expansion. Interdisciplinary studies threaten established structures by attracting students away from subjects or courses offered by 'mainstream' departments. This suggests a need for interdisciplinary studies to be grafted on to existing structures, at least in the early stages of development. Incremental change has been advocated as a means of ensuring that some reforms, however limited, are achieved. An innovator who does not accept this as a realistic goal is likely to become frustrated in attempts to negotiate substantial changes.

The organisational constraints encountered in developing Energy Studies were not clearly manifested at the commencement of the project. Much was done to prepare the ground, the support of the Institute's Director was secured, and enthusiastic members of staff were involved. Despite these actions, there was a lack of organisational readiness to accommodate interdisciplinary studies. In particular, the Institute did not have an agreed framework for interdisciplinary course development. The existing departmental structure was a major constraint, especially when it came to securing resources for the continuation of the Energy Studies project. Funding restrictions confronting tertiary education as a whole were a further dimension of the constraints.

The lack of seniority of key actors and the fact that they were not tenured staff impeded the implementation of Energy Studies. Although this could have been avoided, there was a natural desire in the Energy Studies working party to recognise the contributions of the original innovators. The working party could have been more effective in its work, especially by narrowing the focus of its activities; for example, it was not necessary to seek preliminary approval for the Energy Studies electives.

There is an understandable reluctance for innovators to explore the reasons for the failure of a project with which they have been associated. This ignores the possibility of professional growth through a serious examination of problems encountered in innovation and attempts to overcome them. By sharing such insights with colleagues, educational innovation may hopefully become a more open and rewarding process.

NOTES

(1) A subject is a specific area of study, combinations of which comprise a course.
(2) This role was affected by a period of eight months staff development leave in 1979.

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Review Articles

Evaluating Academic Development

Academic Development Units in Australian Universities and Colleges of Advanced Education. Canberra: Commonwealth Tertiary Education Commission, 1982, vi + 71 pp.

The report by Professor Richard Johnson on Australian academic development units is familiar enough to readers of this journal that no summary of its contents or conclusions is needed here. The document is comprehensive, eloquent, insightful, constructive, if admittedly subjective ('impressionistic' is the word Johnson himself uses). It is also timely -- coming on the heels of the AVCC working party's recommendations on staff development, with its suggestion of mandatory induction courses, regular evaluation of teaching, and greater incentives for the improvement of teaching performance. Both reports have received wide distribution in Australian higher education circles (though, regrettably, not outside: they are virtually unknown in North America or Europe, despite brief mentions in the Times Higher Education Supplement). The Johnson report in particular has been warmly welcomed by academic development professionals, and at least with polite interest by senior administrators in the tertiary sector. If nothing else, the review has served as an excellent piece of formative evaluation for the actiyities of Australian academic development units, even if its wider impact -- for example on rank and file faculty, on student opinion, politicians, not to mention the more general public -- is much harder to estimate.

I was fortunate to be in Australia in 1982 just after the draft of Professor Johnson's report was circulated. I was on leave from my own (extremely small) academic development unit in a large Canadian university, conducting some comparative research on efforts to improve university-level teaching and learning in a number of countries, including North America, Western Europe, and Australasia. This was a follow-up to a previous series of visits made in 1974, when the financial and political climate affecting post-secondary education was much rosier. During my 1982 visit I spent three months in Australia, and visited 13 of the 24 academic development units mentioned by Professor Johnson. I was present when the author discussed his draft report with the directors of academic development units in May 1982 and also had an extended interview with Professor Johnson in Canberra. A year ago the report provided a lively topic of conversation in Australian universities and colleges, and it cropped up frequently in my talks with unit directors and staff, and in my interviews with other Australians, including civil servants and journalists. The comments that follow, then, are partly informed, but also necessarily

fragmentary, and obviously reflect my status as a visiting Canadian, present in Australia for only a brief period.

The first achievement of the Johnson report to an outsider is that it was done at all. Meaningful evaluations of academic development programmes are comparatively rare, despite the fact that evaluation is a mainstream activity of the units themselves. Centra's (1976) huge study of over 1,000 programmes in the U.S.A. showed that only 14 per cent of them had been fully evaluated. And in my own survey of evaluation practices in a sample of programmes drawn from various parts of the world (Knapper, 1979), I found that few of the programmes had been subjected to evaluations that were much beyond the mere monitoring of activities -- number of publications issued, tallies of telephone inquiries, and so on, sometimes supplemented by the comments of staff who had attended unit-sponsored courses or workshops. While comprehensive evaluations of individual units are comparatively rare, evaluations of whole systems are even scarcer. When they have occurred, it is usually in the most negative of climates, often when funds are short and where the evaluation is seen as possibly providing an excuse to terminate a programme. This seems to me to be the worst type of 'summative' evaluation, and it is to the credit of the Commonwealth Tertiary Education Commission that their brief to Professor Johnson was made in a much more open atmosphere, characterised not by threat but by a desire for information. This contrasts sharply with the circumstances surrounding a recent evaluation of the Office of Teaching and Learning of the Council of Ontario Universities, a modest programme that provided important supportive and coordinating services for academic development units throughout the province. The evaluation was lengthy, broad in scope, and the resulting assessment was positive. Nonetheless the Council that had commissioned the study voted to terminate the programme: a decision that probably caused more disillusionment and cynicism than if the evaluation had never been conducted in the first place. At about the same time in Britain the Coordinating Council on the Training of University Teachers was also being disbanded under somewhat similar circumstances.

A second revelation provided by the report for the non-Australian reader will be the documentation it provides of a relatively entrenched position for academic development units within tertiary education establishments in that country. This may seem somewhat paradoxical, when Professor Johnson himself laments the difficulties under which units must operate, including inadequate budgets and staff, obstacles to promotion, resistance by some members of the academic community, and so on. Nonetheless, from a broader international perspective, many Australian academic development units seem in an enviable position, as my recent series of visits showed only too clearly. For example, in Canada there is only a handful of well established units with full-time staff who hold relatively permanent positions, and nearly all of these are in Ontario and Quebec. In Britain the situation is somewhat comparable, although much excellent work is done by committed academics on a more or less 'volunteer' basis. In many Western European nations units have been forced to keep what one of my informants called a 'low profile' in order to survive the current climate of retrenchment. And in the United States, which is often regarded as a mecca for teaching innovations and development activities, many large and apparently thriving academic development units have disappeared virtually overnight in the face of savage financial retrenchment or the loss of external foundation funding upon which so many of them depended (Gustafson and Bratton, 1983).

In contrast, the state of academic development in Australia appears positively brimming with health. Many Australian units were founded long enough ago to imply their incorporation as part of the university establishment; at least

one (TERC at the University of New South Wales) has even published an official history. Nearly all universities and CAEs do indeed possess a unit, and it has been an extremely rare occurrence for an established operation to be disbanded. Despite the fact that this has admittedly occurred in one or two instances, and in others there has been a de facto institutional policy of not filling posts that become vacant, the fact that most units have survived, and that their number has grown, surely indicates a general (even if grudging) acceptance by administrators and academic staff. Indeed, several units have been subjected to extensive evaluations of their activities and effectiveness (e.g. ACUE at Adelaide and HEARU at Monash) and, as a result, received an endorsement from their academic colleagues. In other words, in an economic climate where the largest Canadian university could close down its extremely modest instructional development programme, apparently without qualms and with little faculty resistance, and when the university unit directed by perhaps America's most respected figure in academic development was subject to draconian cutbacks over the past two years, simply to have survived (razor gangs notwithstanding) appears a substantial achievement.

Accepting that academic development is alive and living in Australia, despite doubts in some quarters about whether it is at the peak of health, it is worth going on to consider the more detailed picture painted by the Johnson report of the strengths and weaknesses of various units. Re-reading my draft copy of the document I find it is scattered with pencilled ticks, made during my original quick review of the report in 1982, and indicating how frequently Professor Johnson's comments reflected my own Canadian experiences and perceptions. His comments about the ambiguity of the developer's role in the institution, difficulties of status and obtaining promotion for academic development staff (leading to the sort of conflict felt in Canada, as in Australia, about devoting time to research, and gaining academic respectability, or to service activities, and winning friends), the 'damned if you do/damned if you don't' anecdotes of publicity that is criticised as an unnecessary expenditure when it appears and lamented when it does not -- all these are strikingly familiar and perceptibly observed by Professor Johnson.

Only very occasionally did the report indicate a difference between Australian experience and my impressions of the situation in other countries. One example -- which I quote here because it is given considerable stress by Professor Johnson -- concerns the resistance to academic development units by 'middle management', in particular by department heads. In my own experience, while opposition from the head of a department or a dean is certainly not unknown, the reverse has been more common, with many worthwhile initiatives coming from this source. It is possible that the difference here is cultural. Canadian universities have had a longer tradition of elected department heads, and the term in office is probably shorter. This may make the head more willing to approach a unit for help in organising development activities and encourage a busy -- and sometimes isolated -- chairperson to use the unit director as a source of disinterested and confidential advice. One paradoxical problem may be that the expectations for academic development units are too high, and they are expected to perform miraculous transformations in a few weeks with problems that have proved intransigent for many years. Certainly, however, Professor Johnson is right in singling out these middle managers as crucial for the success of academic development. They play a key role in setting the tone within a department, guiding teaching policies and practices, and controlling academic advancement through decisions on recruitment and promotion, and by serving as the major link between the senior administration and the academic staff. Without their support it is difficult to see how teaching and learning practices can be changed in any fundamental way.

Whereas the department is the basic unit in the institutional structure of universities, academic development units, as Professor Johnson comments, often lie outside this structure. Hence the ambiguous roles, poor promotion prospects, and so on, of unit staff. One partial solution to this dilemma might be to adopt the practice of some North American institutions and to appoint staff to concurrent positions in a department or faculty. At Waterloo, for example, at the time of my appointment as Teaching Resource Person I was also given a tenured position as Professor (in the North American meaning of the term) of Environmental Studies. This type of arrangement is quite common for senior administrators (deans, vice-presidents, and so on) who have an academic position to return to once their terms of office have expired. In my own case, although my salary is totally paid by the Teaching Resource Office, I take a reasonably active part in the affairs of the Environmental Studies Faculty: I teach an undergraduate course each year, supervise several graduate students, am part of a small research team, and sit on a couple of committees. Although these activities obviously take time, they have the considerable compensation of involving me directly in day-to-day teaching activities which are, after all, the focus of concern of the academic development unit. My position within the Faculty has provided an excellent academic base and source of support and advice. It has also proved invaluable for the Teaching Resource Office itself: it is often my own Faculty colleagues who are the most receptive to new ideas and most willing to take initiatives and act as advocates when it comes to the improvement of teaching and learning. It is quite possible that this organisational model might be impractical in an Australian context for any number of administrative reasons. However, in those North American institutions where it has been tried it appears to have succeeded in overcoming some of the problems referred to by Professor Johnson.

In discussing the Johnson report with North American colleagues I am usually asked two questions. What has changed as a result of the report? And, given the relative pervasiveness of academic development in Australian tertiary education, does this mean that the quality of teaching and learning there is superior to what is found elsewhere? It is obviously impossible to give any definitive answer to either question. In the case of the first, constraints of distance and time mean that I am out of touch with developments that may have taken place during the past year. It seems likely, however, that the greatest value of the report is, as I stated at the beginning of this review, as a much-needed and acutely observed piece of formative evaluation that can serve to inform the general academic community and guide instructional developers themselves.

In the case of the second question there is abundant evidence in the report of the beneficial effects of academic development activities on individual teachers, on innovative practices, and with respect to academic policy decisions on matters that range from distance education to study skills for mature students. Professor Johnson might also have cited the achievement of academic developers in establishing HERDSA -- an organisation that seems to be almost taken for granted within Australasia but, to the outsider, seems a remarkable achievement. I can think of no other national organisation that involves both academic developers and faculty at large who have a general interest in university teaching and learning, that publishes a successful journal and newsletter, sponsors continuing education activities for the general academic community, organises a stimulating annual conference, has local chapters in various parts of the country, comments on policies affecting higher education -- and manages to fund nearly all of this on the basis of a modest annual subscription. This must surely be a partial reflection of interest in teaching and learning on the part of a substantial number of Australian academics.

Despite such achievements, it is clear Professor Johnson feels more could be done. He comments, for example, that matters of teaching and learning (and the advice of academic development units) could play a greater role in institutional policy-making. This echoes the sentiment expressed in the AVCC report that staff development units 'carry neither high status nor significant clout within their institutions' (AVCC, p. vi). It seems to me unlikely, however, that the influence of units on policy formation will grow without changing the academic decision-making structure within universities, whereby power is primarily vested in the senior administration and individual departments. This is probably a major reason why very few institutions have, I gather, moved to implement even the fairly modest suggestions for change recommended by the AVCC working party.

But even if the basic structures of the university are slow to change, the climate for academic development in the next decade may be more favourable than many of us have expected, or hoped. Despite the considerable prestige attached to research by many academics (both in Australia and North America), I suspect that a majority of our colleagues are indeed concerned about their teaching performance, if only because it forms a major component of their day-to-day work, and their inadequacies as teachers are often quickly and directly brought home to them through the reactions and achievements of their students. The problem is to capitalise on this intrinsic concern -- or even anxiety -- not only to improve instructional methods but to interest teachers in exploring new ways of encouraging effective student learning. In a recent survey of faculty attitudes in the United States (Watkins, 1983) the largest single group mentioned teaching as the activity that gave them the greatest reward as an academic. It seems possible that the changing climate within higher education could encourage a renewed emphasis in teaching and learning across the university, and prod staff into a more realistic appraisal of what is, for the great majority, their most important academic function. These developments include the gradually changing student population, especially the increasing influx of mature adults who have special learning needs, expectations about the teaching they will receive, and their own rich background of real world experience to draw upon. There is evidence to suggest that these groups are much less tolerant of traditional, didactic approaches to teaching that fail to respond to individual differences and needs, suggesting that staff may have to re-think the way curricula are organised and individual courses are presented. Similarly, the increasing involvement of universities with distance learning is beginning to involve many staff outside departments of continuing education and challenge teachers to devise new presentation methods that go considerably beyond the conventional lecture and tutorial. Still other pressures come from the public at large, especially employers of our graduates, who are becoming less reticent about giving their views of the quality of learning and teaching within institutions paid for out of the public purse. At the University of Waterloo, for example, there are regular meetings with major employers in government, business, and industry to examine their experience with our graduates, and these meetings have had considerable impact on curricula and the way instruction is organised and delivered.

Certainly these factors exist. Whether they will in turn be translated into changes in university teaching and learning is, admittedly, more a matter of faith and optimism. Nonetheless, if such changes are indeed to take place -- and some may argue that the very survival of the university depends upon this happening -- then the contribution of academic development personnel could be crucial. As Professor Johnson rightly argues in his report, academic development units are a unique source of expertise and, if given the chance, could play a crucial catalystic role in changing teaching and learning within universities to respond to the types of pressures sketched out briefly above. In drawing attention to the needs to be filled, the achievements of Australian

units so far, and their potential contribution in the future, Professor Johnson's report has made a valuable contribution, and one that is of relevance not only to the academic development movement, but to higher education in general.

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Academic Tenure

Report on Tenure of Academics. Senate Standing Committee on Education and the Arts. Canberra: Australian Government Publishing Service, 1982.
ISBN 0-644-01970-0. xxv + 182 pp. $10.60.

It is both dismaying and reassuring for a Canadian reader of Tenure of Academics, the Report of the Senate Committee chaired by Senator Baden Teague, to discover that our academic colleagues in the Commonwealth of Australia are facing the same problems we are. Tenure is the focal issue of the Report, an issue raised and defined by concerns about the age profile of academic staff, the rate of staff turnover, the size and distribution of student enrolment, and all the interlocking financial problems associated with the steady-state university. The Committee has fortunately interpreted its terms of reference broadly, and so has considered a range of other questions touching academic appointments, but 'tenure of employment' was the governing phrase in the Senate Resolution of September 1981, and it is the matter to which I will speak in this review.

Any commentator on a sensitive subject like tenure must pick his way carefully. All the more must a commentator from overseas who ventures to discuss a report that was twelve months in the making, and written only after expensive hearings had been conducted and many written submissions considered. But since the editor judges it useful to have the reaction of an academic not familiar with the Australian scene, I offer the following comments.

I

I find the understanding of tenure which is set out in the second paragraph of the Report, and which informs the subsequent discussion in Sections 1 through 4, unclear and in part contradictory. The term tenure itself does not help, of course, since everyone appointed to any post exercises tenure of appointment, according to the terms of the appointment. But if the usage is established, and it certainly is, that tenure signifies a distinct and particularly secure form of academic appointment, then the distinguishing marks of such an appointment must be clearly understood. So far as it goes, it is true to say that an academic staff member with tenure holds an appointment until a specified age limit, subject to other conditions such as health and misconduct (1.2), and if someone holds such appointment throughout an academic career, that appointment can rightly be described as 'permanent'. But in the light of such a definition it is hard to understand how such an appointment can also be said to carry 'an assurance against dismissal' since the grounds of possible dismissal have already been stated. Even if we enunciate the implicit reservation, 'assurance against dismissal unless cause to dismiss be found', the assurance does not serve as a distinguishing mark of tenure, since even a short, fixed-term appointment carries the same conditional assurance during the life of the appointment. Nor, finally, can it be regarded as a distinguishing mark of an appointment with tenure that 'the appointment of such staff can be terminated only after due process' unless that process itself is distinct from the process appropriate for terminating other forms of appointment. Nothing in the text of the Report suggests that the Committee recognizes a distinction between the process for dismissing someone on a probationary appointment and the process for dismissing someone with tenure. Neither of the two sets of dismissal procedures shown in Annex B and Annex C, which apparently span the range of procedures in Australian universities, shows such a distinction.

I am aware that I may be commenting as much on the general understanding of tenure which the Committee encountered, as on the Committee's own formulation. The Committee concludes (1.2) that, 'Tenure in Australia relies more on convention than on contractual rights', and any attempt to summarize a conventional understanding is likely to be unsatisfactory. But if the Committee's formulation is accurate, it discloses a situation with serious disadvantages both for administrations and for academic staff members. If the conventional basis of tenure is so solid that, 'Once tenure has been granted, the grounds on which a staff member can be disciplined or dismissed almost disappear' (2.29), then surely the convention is administratively intolerable (note 1). On the other hand, the Committee does not call attention to any circumstances that would in fact prevent a Vice-Chancellor from seeking to dismiss an academic staff member with tenure, or make it any more difficult for him to do so than to dismiss a staff member at the end of the probationary period. If that is the case, then it is difficult to see what special protection tenure promises other than the conventional reluctance of Vice-Chancellors to exercise the authority vested in them.

For this reader the single most striking feature of the Teague Report is the blurring of the distinction between the probationary appointment and the appointment with tenure. In some respects the probationary appointment appears to be assimilated to the appointment with tenure: the decision made at the end of the probationary period is consistently spoken of as the confirming of tenure, and in calculating the percentage of tenured staff for Tables 3-3, 3-4, and 3-5, staff on probationary appointments are simply incorporated in the category of tenured staff. On the other hand, appointments with tenure can equally be assimilated to the probationary appointment, since the granting of tenure does not bring with it any identifiably greater protection against dismissal than that enjoyed by staff on probation. In that perspective the Committee is doing no more than pursuing the logic of the situation it found when it proposes for all tenured staff a continuing series of probationary periods (4.34-4.49), each to culminate in a full review of the staff member's academic performance. The review would apparently be indistinguishable from the review which came at the end of the first probationary period, and if it revealed a serious inadequacy, could lead to termination of appointment through a process indistinguishable from that which would have been used at the end of the first probationary period.

My concern with the difference between the probationary and the tenured appointment derives from the importance attached to that difference in Canadian universities, and I think it may be illuminating to readers of the Teague Report to know how the difference is generally understood and expressed in Canada.

To begin with, a probationary appointment in a Canadian university is for a fixed term, usually of two or three years. The probationary period is from five to seven years, and thus consists of at least two distinct fixed-term appointments. The conclusion of the probationary period coincides with the expiry of a term appointment, and the question of whether or not to grant the staff member tenure is decided approximately a year before the conclusion of the probationary period. The precise nature of the question addressed in the so-called tenure review is crucial. It is not a question of whether or not the appointment should be terminated--the appointment lapses of itself when the term is reached; rather, the question is whether or not the staff member should be reappointed with tenure. The question is considered by the staff member's department, by a tenure committee, and ultimately by the president, the officer empowered to recommend appointments to the governing body of the University. In the process of tenure review the onus is on the staff member to show that it is in the interest of the University to grant him or her a tenured appointment, and though there are generally careful procedures to ensure that the member's claim is properly considered, the issue is ultimately decided by an officer or board of the University itself.

If a staff member on probation is subsequently granted tenure, he or she receives an appointment which carries greater security, not by virtue of an assurance that it will not be terminated, but by the nature of the process which must be followed if it is to be terminated, a process which lays the burden of proof on the University. Here some history may be useful.

In 1967 the Canadian Association of University Teachers adopted a policy statement in which it was proposed that a tenured staff member be subject to dismissal only on proof of adequate cause before a third-party arbitration committee, whose decision would be final and binding on the staff member and the University (note 2). In the intervening fifteen years that principle has been incorporated in the statutes or regulations of most Canadian universities. Thus the significant difference between a probationary appointment and one

with tenure is that during the period of probation it lies with the academic to show that he or she should be reappointed, whereas once a staff member is granted tenure, it lies with the University to establish cause for dismissal--and not simply to its own satisfaction, but to the satisfaction of a mutually-agreed third party.

In offering this description of the structure of the Canadian system I would not imply that it is free of problems. There is frequent dispute about whether or not a fixed-term appointment is, as the phrase goes, 'tenure-track'; there is frequent dispute about the nature of the appeal available to a staff member who is denied tenure at the end of the probationary period, or a staff member whose first fixed-term appointment is not renewed and who is thus prevented from completing the probationary period. There are redundancy provisions in the regulations or agreements at a number of universities, but they have not been seriously tested and it is not clear how they might condition the dismissal process for tenured staff. Furthermore, the entire picture is complicated by the fact that the academic staff at more than half the universities in Canada are certified bargaining units under the relevant labour legislation, and have negotiated collective agreements with their universities which contain provisions touching appointment, promotion, and dismissal. Under most of these collective agreements the University can exercise the usual management right of dismissal, but the dismissal can in turn become a grievance which is ultimately decided through a process of arbitration in which reinstatement can be awarded.

The modalities are innumerable, but the principle of binding, third-party arbitration in cases of dismissal of tenured staff is recognized in Canada as the basis of security in a tenured appointment. It comes as a surprise to a Canadian academic to find it assumed in the Teague Report that the hearing committee for the dismissal of a tenured staff member will be an instrument of the University itself, that is, of the party seeking the dismissal. Whether the pattern be that in Annex C, where the Commission of Inquiry is appointed ad hoc by the Council, or that in Annex B, where the majority of members of the Joint Committee are designated officers of the University, the report of the hearing committee goes finally to the Council as a recommendation, and the effective decision is thus given to a body which works closely and continuously with the Vice-Chancellor, the very officer who has laid the complaint against the staff member in the first place. To most Canadian academics this process would not appear likely to yield an independent decision.

II

In addition to the matter of dismissal procedures, there are two proposals in the Report that could significantly affect the nature of a tenured appointment: first, the proposal that there be systematic, periodic reviews throughout a tenured appointment; second, the proposal that the percentage of tenured staff at the level of lecturer and above not exceed 90 percent.

It is obviously necessary that there be some effective supervision of the work of tenured academic staff if there is to be a real possibility--as there must be--of dismissal for cause. Whether the reviews recommended by the Committee would actually provide that supervision, and provide it without seriously compromising the advantages of tenure itself, seems questionable.

The energy and time required to mount such an operation should not be under-

estimated. On the assumption that the reviews would be staggered, and that the interval for each staff member would be seven years, the system would entail doing some 100 reviews a year in the larger universities, each review conducted by a three-person committee (and a certain number requiring in addition an academic referee external to the University). Each review would require the consideration of a dossier, an interview with the staff member, and the writing of a report. Since it would be an avowed purpose of such a review to identify persistently or seriously inadequate performances, and since it would be known that such a finding could lead to dismissal proceedings, it must be anticipated that allegations of inadequate performance would be vigorously challenged by staff members.

Furthermore, the possible negative effect of having such a system of reviews in constant operation would need to be weighed. For such a system there would evidently have to be some enunciation of the standards of adequate performance: the annual spectacle of colleagues being tested by such standards, and the prospect of being tested oneself at a known moment in the future could create an atmosphere that neutralized many of the advantages of tenure set out by the Committee in paragraphs 2.2-2.6.

The problem is real, and no doubt the witnesses are correct who claimed before the Committee that present methods of supervision are often ineffective. But it does not follow that because officers of the University are seldom willing to be tough with those whose work they are charged to supervise, therefore committees appointed by such officers will supply the defect. Replacing the invertebrate chairmen with vertebrates (4.38) would not be easy, but it might in the end be less costly and disruptive than introducing an elaborate committee system.

It is apparent from the figures given in Section 3 of the Report that Australian universities and CAEs display the same inflexible staff structure and distorted age profile as the corresponding Canadian institutions. The situation can be traced to a number of historical conditions: the very rapid increase in student enrolment in the 1960's and early 1970's; the scarcity of qualified staff broadly distributed through the several age brackets; the necessity to supply the needed staff by appointing and retaining a very large number of young academics. Tenure did not create those historical conditions, but it now forces universities to live with the consequences of them. I am not convinced that the measures suggested by the Teague Committee to alleviate those consequences would be effective. Unless there are a great many more incompetent or negligent academic staff than the Committee estimates (2.29, 3.37), the dismissal of tenured staff (with or without a periodic review procedure) would not significantly alter the statistical pattern. Nor could a more rigorous review at the end of the probationary period have significant effect since there have been relatively few probationary appointments in recent years. These measures need to be taken, but their effect on staff structure will be negligible.

To impose an upper limit of 90 percent on the proportion of academic staff with tenure (Recommendation 9) scarcely seems feasible through dismissals, and the alternative method, reducing the number of tenured appointments offered to new staff, would be self-defeating, since it would frustrate one of the purposes of the proposal--to bring new blood into the universities and CAEs.

Only a large number of new appointments, drawn from the age groups below 32 and above 46 (3.36) could make staff structure more flexible. Such appointments, however, would require a substantial increase in university grants (not to mention a surplus of senior academic staff). And no one in Australia, or

North America, is counting on that.

The Teague Committee can hardly be criticized for failing to produce effective solutions when the problem they expose is intractable. By showing the problem in its complexity they reduce the traffic in facile solutions. So careful a study as this by a responsible public body must be a great service to tertiary education in Australia. It has no counterpart in Canada.

The findings of the Teague Committee are a sombre reminder that institutions cannot, any more than human beings, disown their history. This may be a period in which there is just not going to be very much flexibility for colleges and universities--at least not the sort of flexibility we became accustomed to in the 1960's and early 1970's.

NOTES

(1) How the premise has been established is not clear. The Report refers (1.15) to an AVCC survey showing that in the three years 1977-79 there were no dismissals of tenured academic staff through formal procedures. But unless formal procedures to dismiss are initiated by those to whom it belongs by statute to do so, the declaration that such procedures are not practicable must be viewed with suspicion as a self-fulfilling prophecy. The same lamentation was often heard from presidents of Canadian universities in the early 1970's, but as the decade proceeded, they were emboldened to try, and during the same 1977-79 period there were four dismissal procedures initiated in Canadian universities, three of them successful, and in the past three years five have been initiated, four of them successful.

(2) This was a significant modification of the provisions for dismissal recommended by the American Association of University Professors in its influential 1940 Statement of Principles on Academic Freedom and Tenure, where the final decision was given to the governing board of the institution.

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Reviews

Critical Thinking and Education. McPeck, John E., Oxford, Martin Robinson, 1981.

> Critical thinking must, therefore, command a place in any institution committed to the pursuit of education because critical thinking is a necessary condition of it. (McPeck, p.37).

In this respect McPeck goes further than the popular critics of education who maintain that critical thinking can improve education. For McPeck, 'education absolutely requires it', it is 'not just a frill or a dietary supplement to education'.

In view of the great popularity of "critical thinking" as an "objective" of teaching a wide range of subjects in schools and tertiary institutions, it is not likely that there will be any objection to McPeck's claims. In fact it will come as a welcome surprise to many that a philosopher is supporting a current educational fashion. Usually the philosophers make life difficult for everyone by nit-picking over objectives that should be of obvious importance to everyone - self-realization, creativity, knowledge, needs-satisfaction - even Bloom's Taxonomy has met resistance from such philosophers.

But - and there's always a "but" with philosophers, isn't there - McPeck is not arguing that critical thinking is an objective of education. His point is that if you are educating then part of what you are doing is developing your students' critical thinking. It is not a goal of teaching English, History and Mathematics, it is part of what is meant by educating someone in these and other domains.

It is now exactly twenty years since this reviewer attended R.S. Peters' inaugural lecture as Professor of Philosophy of Education at the University of London, in which he made the point that it is absurd to refer to the development of knowledge and understanding as an aim of education, as if one could see education as a means to this end. Any educational process necessarily develops knowledge and understanding as an intrinsic part of the activity, not as a movement towards an extrinsic goal. (I think his illustration was that the development of knowledge and understanding in education is not like boarding a bus in order to get to a destination).

That kind of conceptual analysis has, of course, fallen into disrepute. We all know what we mean when we all resoundingly affirm that critical thinking is very important in education, and whether or not it is a "logically" necessary part or a currently popular part is surely beside the point. If we're all agreed, why make waves?

But - and there's that "but" again - what if you think that "critical thinking" is a mental ability, a kind of mental muscle, which is exercised and developed by English and History and Mathematics? McPeck maintains that critical thinking in one domain is inapplicable to another domain. Certainly my own teachers seemed to believe this to be so. Flexing my philosophical muscles in an English essay led to comments such as, "Too abstract, does not attend to the concrete particularities of the text". Despite the three months I spent writing a history essay attempting to explain why the Puritans after the English Civil War took on many of the characteristics of the rulers they had replaced, by examining the applicability throughout history of Acton's phrase about power corrupting, I received a low mark and the comment, "The most interesting fantasy of the year". My teachers clearly believed that the form of critical thinking in one domain is different from that to be found in other domains and I was penalised for confusing them.

The central point of McPeck's book is that critical thinking is field-dependent; '...the proper analysis of good reasons is functionally determined by the various subjects, disciplines and forms of thought'. This was also argued by Paul Hirst in the 1960's particularly in his widely published (and widely criticized) essay, "Liberal Education and the Nature of Knowledge". I imagine that McPeck does not refer to this because it could "place" him in the company of "traditionalists" and also, perhaps, would oblige him to confront the large body of criticism that has been levelled against Hirst's account. This is a major weakness in McPeck's book, since his own account of the field-dependency of reasoning and critical thinking relies a lot on Stephen Toulmin's The Uses of Argument, published in 1958. This was an important book in the 1960's (and I believe it is still important) but much has been written since then which needs to be coped with if McPeck is to convince anyone else but Hirstians like myself. Along with Hirst, McPeck and my teachers, I am convinced that the various disciplines are "logically" distinct and that developing "critical thinking" in one discipline/domain/field/form of knowledge is distinguishable from and (to varying degrees) minimally transferable to its development in another. The problem remains, however, that there has been no adequate follow-up to Hirst's suggestive essays to specify what is meant by "logically" and, concomitantly, how to characterise disciplines,domains, fields or form of knowledge. In his only reference to Hirst, at the end of his book, McPeck acknowledges that the reader might detect 'a certain bias towards the so-called 'disciplines approach' but denies that anything he has to say about critical thinking depends upon this bias.

> Indeed, as I see it, one of the strengths of the present analysis is that while it recognizes that critical thinking is connected logically with specific tasks or subject matter, it places no a priori restrictions on what that subject matter may be. Critical thinking could well play a substantial role in courses on consumerism, business management or how-to-do-it, just as it can in the more traditional discipline. (p.161).

But is there a "logic" distinctive of consumerism, business management or how-to-do-it? Is the "critical thinking" involved in these fields and tasks logically distinguishable just as it is in the more traditional disciplines? How adequately has it been distinguished in these disciplines themselves? There are some highly suggestive comments at the end of Richard Pring's essay on "Curriculum Integration" (The Philosophy of Education, ed. R.S. Peters, O.U.P., 1973) which indicate the very considerable complexity of the "logical" connections between the disciplines. (Propositions of logical type A may interrelate with propositions of logical type B by being "constitutive" of type B, "evidence for" type B, "necessary conditions" of type B or "instrumental to" our grasp of type B propositions.)

The important task for those who maintain the field-dependency of critical thinking is to make out a case for the "logical" independence of the fields in which it is alleged to be distinguishable. A refusal to place a priori restrictions on the subject matter of critical thinking will receive ready assent. But a failure to establish that there is a distinctive logic specific to various tasks or subject matter leaves the critical thinking that characterizes them unspecified. In McPeck's sense of "critical thinking" ("logically connected with specific tasks or subject matter") it could be equally concluded that critical thinking could well not play a substantial role in the courses he mentions or in the traditional disciplines.

I am pre-disposed to enjoy McPeck's critique of those who try to test "critical thinking" as if this had no connection with context or discipline. And the book serves the purpose of deterring those who might be impressed by the work of such writers as De Bono. De Bono is influential, which is remarkable since McPeck finds difficulty in quoting anything from his work that is worth attending to. His case against the view of De Bono and others that critical thinking might best be taught as a separate subject is convincing, so far as it goes. But establishing the incoherence of the idea of teaching critical thinking in isolation from specific content is to clear away some of the undergrowth which has accumulated around the notion. The difficult work on the "logic" of the various forms of thought and enquiry and the extent to which this determines the development of critical thinking has yet to be done.

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More Random Walks in Science. Robert L. Weber, Bristol and London, The Institute of Physics, 1982, ISBN 0-85498-040-7, 208 pp. £9.95.

You have heard, no doubt, the one about the Englishman, the Irishman and the Scot, but has anyone told you about the electron, the neutron and the quark, or the story of the sea lily, the sea basket and the urchin? Probably not, for such jokes do not exist.

The province of humour, according to a useful little table in Fowler's *Modern English Usage*, is human nature. Its method is observation; its aim, discovery; its audience, the sympathetic. If that is the province of humour then science is not humorous, though psychology may be. Scientists, as scientists, are therefore not humorists, but they could be wits for wit, Fowler tells us, throws light, its province is words and ideas, its method surprise, and its audience, the intelligent.

You must be careful how you use wit for your audience may take you seriously. Consider one of the finest scientific examples extant - one that sustains itself for the length of a book - Harald Stuempke's monograph on the Rhinogradentia or snouters. These formed a group of mammals with diversified proboscises that were endemic to the Hi-Iay islands which are now, alas, with

Atlantis. The monograph is a superb parody of the typical Teutonic anatom-ecologibiologische Bericht but, nevertheless, Lawlor included the snouters in his review of the orders of mammals in 1979. *The Snouters* may be parody but there's a lot of sound biology in it, even if the animals are imaginary. A colleague often uses the group in one of his classes as an example of adaptive radiation of mammals. It usually takes an hour or two before the last student realises that not only are the snouters extinct but that they never even existed. In that hour or two he has learned, however, something of evolutionary thought which I suspect that he will remember better than he would have done if sea lilies, sea baskets and urchins had replaced the snouters.

There is another danger in being witty, of course, and the fate is even worse: your audience not believing what you tell them, but believing that you believe it yourself. Who can ever be sure about Lawlor any more?

Despite the dangers you may still feel that your teaching would be enlivened by some shafts of wit, and you might think of turning to Robert Weber's second anthology, *More Random Walks in Science* as a source. Alas, you will be disappointed for, as we all know, no lecture hour is long enough to include all the important things that we simply have to tell our students, and Weber has neglected to include any useful 'one-liners' of the kind made famous by *Readers Digest*. You will glean some useful tips, however: how to cooperate with the family cat in writing a paper (Hetherington and Willard, *Physical Review Letters*, 35(21), 1975), or with the dog in teaching the basic idea of the closed-loop control.

The dog, I should point out, is a cartoon character which dashes between two switches in order to regulate the voltage. The author/artist claims that he once had to regulate the voltage in a famous Oxbridge laboratory in such a manner; he also claims that his English audience took the little animal to their hearts and thus learned painlessly all about closed-loop control, but I am sure that the dog would switch an Australian audience off.

You will probably find this anthology more useful as a guide to your post-graduate student than as an aid in teaching your undergraduates. It will at least show him how science really works. He will be mollified when he gets back his first red-inked paper from the referees if has seen before what they did to Shelley's *Ozymandias*. He will learn how to manage on current grants if he follows R.W. Wood, the doyen of chewing-gum and stringers who, incidentally found yet another use for a cat. He will know how to turn poor data into good theory if he uses the mathematics outlined in 'Curve Fitting' and 'Error Bars', and he will realise why the data are always poor if he commits Finagle's laws to memory. But he will find that there are rewards: if he gets to be as good as Zeeman and Lorenz he may finish stained in glass in the University of Leiden.

In my own teaching I have found that the bizarre sticks in the mind. I always tell my students about a curious symptom of hook-worm disease, namely a great desire to eat soil, and that the soil in some parts of the southern states of the USA is particularly esteemed, presumably because it is rich in iron. This is a piece of useless knowledge that rouses my students, especially when I ram it home with an account of the Texan mail-order merchant who would despatch the best-eating soil to Texans home-sick for the old sod. I am sure that years from now my students will remember at least the hook-worm.

If the mathematicians are looking for a bizarrerie that will fasten down the transcendental numbers, they will find the full story of π in the hands of

the Indiana State Legislature in 1897. The House decided that it should be worth 3.2 but the Senate, in its wisdom referred it to the Committee of Temperance. It never did become law: π was too transcendental.

You have got to watch your bizarreries for the most beguiling are often the least true. I have lost count of the number of times that I have read, or have been told, that the American deer fly cruises at 818 miles per hour, and that its near relative, a botfly, consumes the testicles of squirrels which, with great altruism, nibble each other's private parts in an assault on the common enemy. Sadly both stories are untrue - they are beautiful theories slain by inconvenient facts - and Weber demolishes the first himself.

Seriously though, Weber's collection is a delightful miscellany but it is curious how many of the contributions first appeared in physics journals. As a biologist I wonder if this means that there is little real physics left to do, or is it simply that its practitioners are having to fill in their time while they wait for the grants to come through? On the other hand perhaps biologists take themselves too seriously. The consequence, however, is that some of the wit is above me; possibly it is merging into irony (exclusiveness; statement of facts; mystification; an inner circle: Fowler again). Take, for example, the diagrams of the cyclotron as seen by various kinds of people, *viz.* the inventor, the experimental physicist, the theoretical physicist, the health physicist, the electrical engineer, the mechanical engineer, the operator, the laboratory director, the visitor, the governmental funding agency and the student. The author should have taken a leaf from *Tristram Shandy* and included a blank page for the layman.

Never mind: every off-duty scientist will find something here to please him. There is wit, there is irony, there is parody and, since science and scientists often deserve it, satire. There are plays on words, which I abhor. There is even humour for what, after all, is more human than Captain DeKhotinsky, the tea-time Rutherford or the unnamed student who would not disclose the 'right way' to measure a tall building with the help of a barometer even though his degree depended upon it. If you are looking for the absent-minded professor you will find at least two: J.J. Thomson whose wife suspected him of leaving college without his trousers, and Paul Dirac who, having married the sister of Eugene Wigner, was found wandering in a dazed way around Cambridge announcing that 'Wigner's sister is having a baby'. The two occurrences were coincidental. And, finally, you will find the best advice of all to a lecturer. It came from Michael Faraday:

> The most prominent requisite to a lecturer, though perhaps not really the most important, is a good delivery; for though to all true philosophers science and nature will have charms innumerable in every dress, yet I am sorry to say that the generality of mankind cannot accompany us one short hour unless the path is strewed with flowers. (p. 23).

Here's flowers for you, in this anthology. Some you will use in teaching, and most you will enjoy. I myself will probably go on offering the withered blooms that I have offered for years, even though my audience wilts.

I'm funny that way.

Arthur Woods
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Browsings

Educational practice is sometimes depicted as being overly responsive to ideas which have little to recommend them beyond their modishness. A very different picture is drawn by K.A. Sirotkin ('What you see is what you get', Harvard Educational Review, 53, 16-31, 1983) in a summary of the findings of a survey of 1000 school classrooms in the United States which revealed:

> ... a lot of teacher talk and a lot of student listening ... almost invariably closed and factual questions; little corrective feedback and no guidance; and predominantly total class instructional configurations around traditional activities - all in a virtually affectless environment.

Sirotkin describes the remarkable lack of change in the practice of teaching and learning as 'one of the most consistent and persistent phenomena known in the social and behavioural sciences'. Would a similar survey of teaching in higher education produce results which were any different?

Some of the difficulties involved in generalising about teaching have recently been commented upon by Michael Apple ('Interpreting teaching', Educational Studies, 14, 112-135, 1983) who warns against condemning teachers simply because they use methods which many theorists consider inappropriate. He recalls a course which he studied as a graduate student and in which the lecturer always read from notes, allowed no questions or discussion, and treated students' errors very unsympathetically.

> I could go on, documenting the multitude of pedagogical and curricular 'errors' found in this particular course ... yet while I cannot speak for the other graduate students who sat in that dark and musty hall of Columbia University in the mid-1960s, it was simply one of the most powerful classes I ever took.

The bewildering variety of individual approaches to teaching is very well portrayed in Masters: Portraits of Great Teachers edited by J. Epstein (Basic Books, 1981). Here former students reflect upon what they learnt from university teachers in ways which should create doubts in the minds of those who still await the day when a science of teaching will be established. The latter should also read Teacher Thinking by E. Elbaz (Croom Helm, 1983), an important contribution to our understanding of how teachers work and which employs a research technique which could profitably be adopted by students of the academic profession. It is astonishing how little we know about both the ways in which academics approach their teaching tasks and the nature of the educational knowledge which they deploy in the course of their work.

One thing seems certain: as the size of the academic profession has grown so the proportion of eccentrics within it has diminished. John Barrett (1753-1821) held the chair of oriental languages at the University of Dublin. Although fluent in Latin and Greek his command of English was precarious. He once translated 'Gallia est omnis divisa in partes tres' as 'All Gaul is quartered into three halves'. William Buckland (1784-1856), Oxford's first professor of geology, collected rocks from all parts of Britain and developed a very accurate sense of locality as a result of his travels. While riding towards London at night he and a friend became lost. Buckland dismounted, scooped up a handful of earth and, after sniffing it, announced that they were

in Uxbridge. These anecdotes, together with many others with which to enliven lectures, are to be found in C. Caulfield's The Emperor of the United States of America and other Magnificent British Eccentrics (Routledge, 1981). Here also are some details of the life of the remarkable Clotworthy Skeffington, second Earl of Masserene.

Another recent work which ought to be in every lecturer's library is The Oxford Book of Aphorisms compiled by J. Gross: even the dullest discourse can be given some sparkle with the aid of the contents of its 365 pages. 'I am not fond of expecting catastrophes, but there are cracks in the universe' (Sydney Smith); 'When smashing monuments save the pedestals - they always come in handy' (Stanislaw Lec); 'The University brings out all abilities, inoluding stupidity' (Chekhov).

In the previous issue we mentioned some examples of academic longevity and precocious graduation ages. The Irish Republic recently issued a stamp to commemorate William Hamilton's discovery on 16 October 1883 of the formulae for quaternion multiplication. While still an undergraduate at the University of Dublin he was made professor of astronomy and at the age of 21 was appointed Astronomer Royal of Ireland. Even during the academic boom of the 1960s it seems unlikely that anyone was able to match that.

NOTES FOR CONTRIBUTORS

Contributions are invited, dealing with any aspect of higher education, which seek to improve practice through research, evaluation or scholarly reflection. Papers concerned with both the practice and theory of higher education in specific disciplines are welcome. Contributions which cut across specialist disciplinary or research interests to focus upon the central concerns of higher education will be especially welcome. Authors are also encouraged to publish brief research reports and make detailed data available to readers on request. Each issue will include a major review of an area of educational practice or research: those interested in preparing such a review should contact the editor. Book review articles and critical notes will also be published.

Manuscripts should be sent to the editor, c/- TERC, P.O. Box 1, Kensington, N.S.W. 2033, Australia. Three clear photocopies should be sent and the author should retain the original (as the photocopies will not be returned). Manuscripts should be typed on one side of the paper; be double-spaced, have ample margins, and include an abstract of 100—150 words. Authors may find it convenient to prepare the manuscript in the format used by the journal. The authors of papers which are accepted for publication will be required to prepare the final copy in camera-ready format: details of this will be sent upon acceptance. It will be assumed that submitted papers have not been published elsewhere and are not currently being considered by another journal.

Offprints will not be supplied. Contributors will receive three copies of the issue in which their paper appears.

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